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OF THE

LITERARY & PHILOSOPHICAL SOCIETY

OF

LIVERPOOL,

DURING THE

FORTY SEVENTH SESSION, 1857-58.

No. XII.

LIVERPOOL:
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1858.

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CONTENTS.

List of Members—Ordinary v
Corresponding xii
Balance Sheet xv
Annual Meeting—Report 9
New Council Elected 12
Second Meeting 14
Mr. Brooke—"Warwick and Salisbury" 16
Pedigree 16
Mr. Archer—"Natural History Excursions" 35
Extraordinary Meetings (Reporting Business) 46, 47
Third Meeting 47
Fourth Meeting 48
Mr. Hamilton—"Composition of Rotatory Motion" ... 49
"Description of the Gyroscope" 57
Mr. Elliot's Researches 60
Fifth Meeting 64
Mr. Samuelson—"Smelting and Assaying Tin Ores" 64
Sixth Meeting 65
Mr. Bell—"Preservation of Meats in Metallic Cases" 65
Rev. H. H. Higgins—"Botanizing Stations" 65
Seventh Meeting 75
Mr. Foard—"Moral Dignity of the Shaksperian Drama" 75
Eighth Meeting 119
Dr. Ihne—"International Arbitration" 119
Ninth Meeting 121
Mr. Bell—"Preserved Milks and Meats" 122
Mr. Clay—"Puddled Steel" 122

Digitized by Google

TENTH MEETING 123
Dr. Retslag—"Influence of Christianity on the Roman Matrimonial Law" 123
ELEVENTH MEETING 142
Mr. Duckworth—"Fossils of Perim" 142
TWELFTH MEETING 158
Dr. Ihne—Emendation on "Julius Cæsar" 158
Rev. H. H. Higgins—"British Hymenomycetes" ... 159
" " "Local Fungi—Hymenomycetes" 159
" " "Death of the Bee by Parasitic Fungus" 160
Mr. Morton—"On the Flora and Fauna of Geological Systems" 163
THIRTEENTH MEETING 176
Mr. Brockholes—"On Rearing Macro-Lepidoptera" 176
FOURTEENTH MEETING 194
Dr. Dickinson—"On the Climate of Egypt and Nubia" 195
FIFTEENTH MEETING 226
Mr. Hutchinson—"On Western Africa as a Cotton Growing Country" 227
Rev. H. H. Higgins—"On the Liability of Shells to Injury from the Growth of a Fungus" 227
DONATIONS 229

APPENDIX.

Rev. H. H. Higgins—I, British Hymenomycetes. 1
" " II, Local Fungi—Part 1.... 55

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Feb. 7, 1834 Baines, Thomas, *Parliament-street, Westminster, London.*

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March 9, 1857 Bell, Christopher, *Moor-street,* 30, *Goree, and* 64, *Bridge-street, Birkenhead.*

Feb. 6, 1854 Bennett, William, *Sir Thomas's Buildings, and* 109, *Shaw-street.*

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Dec. 11, 1848 Bishop, Rev. Francis, *High Park-street.*

Feb. 8, 1847 Bloxam, Frederick William, *Alliance Bank, London.*

Nov. 7, 1834 Boult, Francis, Jun., 2, *Rumford-place, and Devonshire-road, Claughton.*

Jan. 11, 1858 Botterill, Charles, 3, *Cable-street, and Seaforth.*

*March 6, 1835 Boult, Swinton, 3, *Bedford-street South, and* 1, *Dale-street.*

Nov. 13, 1854 Bretherton, Edward, F.G.S., 53, *North John-street, and* 47, *Hamilton-square, Birkenhead.*

Nov. 29, 1852 Brewer, John, Barrister-at-Law, *London.*

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Oct. 21, 1844 Bright, Samuel, Esq., 1, *North John-street, and Sandheys, Mill-lane, West Derby.*

Nov. 17, 1856 Broadbent, William Henry, M.D.Edin., M.R.C.S.E., 31, *Rodney-street.*

*Jan. 8, 1855 Brockholes, James Fitzherbert, 16, *Egerton-terrace, Cleveland-street, Birkenhead.*

*Nov. 12, 1855 Brooke, Richard, F.S.A., 16, *Canning-street.*

May 5, 1851 Brougham, James Rigg, Barrister-at-Law, Reg. Court of Bankr., 20, *South John-street, and* 10, *Dingle-view, Dingle-lane.*

May 4, 1857 Burton, Rev. Charles Henry, M.A.

*May 1, 1848 Byerley, Isaac, F.L.S., F.R.C.S.E., *Myrtle Cottage, Victoria-road, Seacombe.*

Feb. 7, 1848 Casey, George, 52, *Naylor-street, and Elmfield, Mere-lane, Walton.*

Dec. 1, 1851 Clare, John Leigh, 11, *Exchange-buildings, and Richmond-terrace, Breck-road.*

Oct. 21, 1844 Clay, Robert, 52, *Saint Anne-street.*

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Jan. 26, 1857 Clay, William, 97, *Sefton-street, and* 4, *Parkhill-road.*

May 4, 1857 Cleaton, John D., M.R.C.S.E., *County Lunatic Asylum, Wakefield.*

Nov. 16, 1857 Cooper, Joseph, *Oak House, Aigburth.*

May 31, 1858 Collingwood, Cuthbert, M.A.Oxon., M.B., F.L.S., Lect. on Botany, Liv. Roy. Inf. Sch. of Med., 31, *Rodney-street.*

Jan. 22, 1850 Cox, Henry, 15, *Exchange-alley N., & Poplar-rd., Oxton.*

Jan. 12, 1857 Cranbrook, Rev. James, *Liscard.*

Feb. 4, 1856 Cunningham, John, F.G.S., 5, *Cook-street.*

Oct. 21, 1844 Dale, Robert Norris, *Exchange-street E., and Childwall Abbey.*

*April 6, 1840 Dickinson, Joseph, M.A., M.D.Dub. and Cantab., F.R.S., M.R.I.A., F.L.S., F.B.S.E., Phys. to Liverpool Royal Infirmary, 92, *Bedford-street S.*

Nov. 27, 1848 Dove, Percy Matthew, F.S.S., 1, *North John-street, and* 49, *Hamilton-square, Birkenhead.*

Jan. 23, 1848 Drysdale, John James, M.D.Edin., L.R.C.S.E., 44, *Rodney-street.*

Feb. 4, 1856 Duckworth, Henry, F.G.S., 2, *Gambier-terrace, Hope-st.*

May 17, 1858 Duckworth, Dyce, 2, *Gambier-terrace, Hope-street.*

Jan. 9, 1837 Duncan, William Henry, M.D.Edin., Medical Officer of Health, 2, *Cornwallis-street, and* 17, *Peel-terrace, Upper Canning-street.*

May 3, 1833 Eden, Thomas, M.R.C.S.E., 345, *Park-road.*

*Nov. 27, 1848 Edwards, John Baker, Ph.D.Gies., F.C.S., Lect. on Chemistry, Liverp. Sch. of Med., 46, *Nelson-street.*

Nov. 16, 1857 Elliot, James, Professor of Mathematics, Queen's College, 114, *Falkner-street.*

Oct. 21, 1844 Ellison, King, F.R.C.S.E., 30, *Rodney-street.*

Dec. 15, 1856 England, Rev. James, M.A., 56, *Grove-street.*

Nov. 18, 1850 Evans, Henry Sugden, F.C.S , 52, *Hanover-street, and Huskisson-street.*

*Dec. 14, 1846 Faram, John, 8, *Railway Cottages, Edge-hill.*

*Dec. 13, 1852 Ferguson, William, F.L.S., F.G.S., *Gresham House, Old Broad-street, London, E.C.*

Nov. 29, 1852 Fischel, Rev. A., *New York.*

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April 16, 1849 Fisher, William M'Naught, Ph.D., F.R.A.S., 36, *Upper Parliament-street.*

*April 3, 1837 Fletcher, Edward, 4, *India-buildings.*

Feb. 6, 1854 Fletcher, Fred. Dicker, M.R.C.S.E., Lect. on Anat. and Phys., Liverp. Sch. of Med., 15, *Upper Duke-street.*

*Mar. 19, 1855 Foard, James Thomas, 34, *Church-street.*

*Feb. 6, 1854 Gee, Robert, M.H.Heidelb., M.R.C.S.E., 10, *Oxford-st.*

April 20, 1857 Glazebrook, Nicholas Smith, M.R.C.S.E., *Hayman's-green, West Derby.*

Dec. 12, 1853 Godden, Joseph, M.R.C.S.E., *Village-road, Oxton, Cheshire.*

Oct. 15, 1855 Goodwin, Joseph, 7, *Wheatland-lane, Seacombe.*

March 3, 1856 Grainger, John, B.A., 4, *Chapel-street, and Palatine Club, Bold-street.*

Nov. 14, 1853 Greenwood, Henry, 32, *Castle-street, and* 12, *Fairfield-crescent, Fairfield.*

Nov. 30, 1857 Grimmer, William Henry, 6, *Castle-street.*

Jan 22, 1855 Hakes, James, M.R.C.S.E., Surg. North. Hospital, 12, *Maryland-street.*

Nov. 30, 1857 Hall, Robert Henry, 18, *King-street.*

Dec. 16, 1850 Hamilton, George, F.R.A.S., F.C.S., Prof. of Chemistry, Queen's College, *Walton-view, Egremont.*

*Jan. 21, 1856 Hardman, Lawrence, *Sweeting-street, and Rock Park, Rock Ferry.*

Nov. 14, 1837 Hartley, John Bernard, *Coburg-dock, and* 10, *Bedford-street South.*

*March 7, 1842 Heath, Edward, Esq., *Orange-court,* 37, *Castle-street, and St. Domingo Grove,* 114, *Breckfield-rd. N., Everton.*

Dec. 12, 1855 Hess, Ralph, 15, *South John-street, and Upper Duke-st.*

Dec. 28, 1846 Higgins, Rev. H. H., M.A.Cantab., F.C.P.S., *Rainhill.*

*Oct. 31, 1836 Higginson, Alfred, M.R.C.S.E., Surg. South. Hospital, 44, *Upper Parliament-street.*

Jan. 12, 1857 Holden, Erasmus, *Widnes, Warrington.*

Nov. 13, 1854 Holland, Charles, 17, *Tower-buildings North, and Liscard Vale, Egremont.*

Mar. 22, 1847 Horner, Henry P., 10, *Bamett-street, and* 53, *Everton-rd.*

Nov. 4, 1850 Howson, Rev. John Saul, M.A. Trin. Coll. Cantab. Principal of the Collegiate Institution, *Shaw-street, and* 4, *South Hill-street.*

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*Nov. 13, 1854 Hunter, John., Memb. Hist. Soc, of Pennsylvania.

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Jan. 26, 1857 Hutton, David, 3, *St. George's-crescent, and* 81, *Everton-road.*

*April 29, 1850 Ihne, William, Ph.D.Bonn, 11, *Carlton-terrace, and* 316, *Upper Parliament-street.*

Feb. 23, 1857 Imlach, Henry, M.D.Edin., 3, *Bedford-street N.*

*Oct. 21, 1844 Inman, Thomas, M.D.Lond., F.B.S.E., Lect. on Principles and Practice of Medicine, Liverp. Sch. of Med., Phys. to Northern Hospital, 29, *Rodney-street.*

Feb. 8, 1858 Jones, Jabez, 27, *James-street*

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Oct. 20, 1856 Jones, Rev. John Herbert, M.A., 115, *Church-st., Everton.*

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May 5, 1851 Jones, Roger Lyon, 14, *E. Queen's Dock, and* 1, *Great George-square.*

Feb. 19, 1855 King, Alfred, 14, *Newington, and* 9, *Netherfield-road S.*

Feb. 8, 1858 Keith, William, *Lord-street, and Castle-street.*

Jan. 10, 1848 Lamport, William James, 21, *Water-street, and* 5, *Beech-terrace, Beech-street, Fairfield.*

*Jan. 14, 1839 Lassell, William. F.R.SS.L. and E., F.R.A.S., 27, *Milton-street, and Broadstones, Sandfield-park, West Derby.*

Oct. 21, 1844 Lear, John, 1, *North John-street, and* 22, *Holland-terrace, Duke-street, Edge-hill.*

Feb. 23, 1857 Lewis, James, 6, *Water-street.*

Feb. 6, 1854 Lidderdale, William.

Feb. 22, 1858 Little, Robert, 3, *Vernon-street.*

Nov. 17, 1856 Livingston, Ronald, 78, *Lord-street, and Myrtle Bank, Holly-road, Fairfield.*

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Oct. 21, 1844 M'Andrew, Robert, F.R.S., F.L.S., *Allhallows-chambers, Lombard-street, London.*

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Dec. 11, 1854 M'Ilveen, Professor, Alexander, Principal Liverpool Institute, *Queen's College, and* 9, *Sandon-terrace.*

Dec. 29, 1855 Mackinlay, Daniel, 31, *St. James-street, and* 77, *Cornwallis-street.*

Dec. 15, 1856 Malleson, Rev. F. A., *Enfield, Palm-grove, Claughton.*

April 4, 1853 Marrat, Frederick Price, 22, *Arcade, and* 68, *Great Newton-street.*

Dec. 11, 1848 Marshall, Buchanan, M.D.Glasgow, 29, *Islington-terrace.*

Jan. 21, 1839 Martin, Studley, *Exchange-chambers, and* 113, *Bedford-st.*

Feb. 5, 1844 Mayer, Joseph, F.S.A., F.R.As.S., F.E.S., &c., 68, *Lord-st.*

May 2, 1853 Milner, Rev. James Walker, M.A., 1, *Downshire-terrace,* 324, *Upper Parliament-street.*

Jan. 8, 1855 Morton, George Highfield, F.G.S., 9, *London-road.*

April 16, 1849 Moss, Rev. John James, B.A., *Upton, Cheshire.*

Oct. 29, 1850 Mott, Albert Julius, *South Castle-street, and Orchard-hey, Rice-lane, Walton.*

April 3, 1854 Mott, Charles Grey, *Birkenhead, and Tranmere.*

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Jan. 26, 1857 Neoroji, Dadabhai, *London.*

Oct. 20, 1856 Nevins, John Birbeck, M.D.Lond., M.R.C.S.E., Lect. on Materia Medica, Liv. Sch. of Med., 25, *Oxford-street.*

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*Nov. 29, 1847 Nisbet, William, L.Fac.P.S.G., 18, *Church-st., Egremont.*

*Oct. 15, 1855 North, Alfred.

Nov. 16, 1857 Pacheco, Don Manuel, 52, *Hanover-street.*

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Feb. 6, 1854 Prange, F., 10, *Dale-st., and* 2, *Grove-park, Lodge-lane.*

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Nov. 17, 1851 Redish, Joseph Carter, 18, *Chapel-street.*

Feb. 6, 1854 Rees, William, 179, *Upper Parliament-street.*

Dec. 15, 1856 Retslag, Carl. Ph.D. Berlin, Professor of German Literature, Queen's College, 173, *Grove-street.*

Mar. 20, 1854 Rigge, Thomas, 64, *Rodney-street.*

Nov. 2, 1840 Robberds, Rev. John, B.A., 10, *High Park-street, Toxteth-park.*

April 18, 1853 Rowe, James, 2, *Chapel-walks, and* 51, *Shaw-street.*

April 28, 1856 Salusbury, Sir John S. Piozzi, *Brynbella, St. Asaph.*

May 26, 1856 Samuelson, Newton, F.C.S., 3, *Hackin's-hey, and* 59, *Hope-street.*

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April 6, 1846 Scholfield, Henry Daniel, M.D.Oxon., M.R.C.S.E., 14, *Hamilton-square, Birkenhead.*

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Jan. 23, 1843 Taylor, Robert Hibbert, M.D.Edin., L.R.C.S., F.B.S.E., Lect. on Opthalmic Medicine, Liverpool School of Medicine, *Percy-street.*

Dec. 11, 1854 Thompson, Samuel Henry, Esq., *Thingwall Hall, Knotty Ash.*

Dec. 10, 1849 Thomson, David Purdie, M.D.Edin., L.R.C.S.E., 11, *Nelson-street, Great George-square.*

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*Feb. 19, 1844 Turnbull, James, M.D.Edin., Phys. Liverp. Roy. Infirm., 19, *Upper Duke-street.*

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Oct. 21, 1844 Peter Rylands, *Warrington.*

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Oct. 21, 1844 Signor L. Ballardi, *Turin.*

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1847 Sir William Rowan Hamilton, LL.D., Hon. F.R.S.E., M.R.I.A., F.R.A.S., F.C.P.S., Astronomer Royal of Ireland, *Dublin.*

Nov. 26, 1849 Thomas Nuttall, F.L.S., *Rainhill, Lancashire.*

Nov. 26, 1849 Rev. Thomas Corser, M.A., *Stand, Bury.*

Jan. 8, 1850 Rev. St. Vincent Beechy, M.A.Cantab., *Worsley, near Eccles.*

Jan. 27, 1851 James Smith, F.R.SS.L. and E., F.G.S., &c., *Jordanhill, Glasgow.*

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Feb. 24, 1851 Henry Clarke Pidgeon, *London.*

Feb. 24, 1851 Rev. Robert Bickersteth Mayor, M.A.Cantab., Fell. St. John's Coll. Cantab., F.C.P.S., *Rugby.*

Jan. 26, 1852 Thomas Spencer, *London.*

Jan. 26, 1852 William Reynolds, M.D., *Coed-du, Denbighshire.*

Oct. 17, 1853 Rev. James Booth, LL.D., F.R.S., &c., *Wandsworth, Surrey.*

Feb. 23, 1857 Thomas Hutchinson, H.M. Consul *Fernando Po.*

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Dr. *The Literary and Philosophical Society, in Account with* Isaac Byerley, *Treasurer, to October 19th, 1857.* Cr.

	£	s.	d.
To paid Mrs. Johnson, for Tea, Coffee, Candles, Attendance, &c.	11	15	2
,, Collector's Commission	4	5	0
,, Greenwood—Printing	49	10	3
,, Tinling—Ditto	7	16	0
,, Ditto—Reporting	10	10	0
,, Benson & Mallet—Minute Book	1	9	0
,, Isaac—Address to W. Brown, Esq., M.P.	3	3	0
,, Prince Albert's Speeches	0	10	6
,, Binding	3	11	0
,, Secretary—Postages and Delivery of Circulars, Letters, Parcels, Proceedings, Stationery, &c.	19	1	2
,, Bookcase—alterations	3	10	0
	£115	1	1
To Balance carried down	200	15	5½
	£315	16	6½

October 19th, 1856, Errors Excepted.

(Signed,) Isaac Byerley, *Treasurer.*

Thomas Inman, M.D.
T. C. Archer, } Auditors.

Oct. 19.	£	s.	d.
By Balance from Last Account (Oct. 20, 1856)	187	14	6½
,, Subscriptions—Arrears	12	12	0
,, ,, —Annual	102	18	0
,, Entrance Fees	12	12	0
	£315	16	6½

Balance brought down;—

	£	s.	d.
Capital Account	136	10	0
In hands of Treasurer	64	5	5½
	£200	15	5½

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THE LIVERPOOL

LITERARY AND PHILOSOPHICAL SOCIETY.

ANNUAL MEETING—Forty-seventh Session.

Royal Institution, October 19th, 1857.

THOMAS INMAN, Esq., M.D., President, in the Chair.

The Secretary commenced the business of the evening by reading the following report:—

The retiring Council have but a brief report to present at the opening of another Session. That which has closed was very successful, a larger number of papers than usual having been offered, and these at an earlier period than is generally the case, thereby considerably furthering the sessional business.

The society lost by death two distinguished corresponding members—the Right Hon. the Earl of Ellesmere, K.G. and the Rev. Dr. Scoresby, F.R.S.; and by the same cause, two of its ordinary members—Richard Vaughan Yates, Esq., and Robert Bickersteth, Esq. Its strength of members compared with that at the beginning of the last Session may be thus stated:

Ordinary members on the roll at last annual meeting	140
Ordinary members elected since then	29
Total ordinary members enrolled	169

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Total ordinary members enrolled		169
Ordinary Members dead	2	
„ „ resigned — Messrs. T. F. Anderson, H. Behrend, T. Gray, A. Holt, C. Kirwan, J. M'Cann, N. McLeod, W. H. Pearse, and H. W. Shain	9	
Ordinary members removed from the roll— Messrs. F. Archer, J. B. Aspinall, J. T. Danson, De Finance, and F. L. Hodson	5	
	—	16
Total ordinary members at present time.....		153
Corresponding members on former list...	44	
Elected since then	1	
	—	45
Dead	2	
	—	43
Total members at opening forty-seventh Session		196

The volume of "Proceedings" is far advanced, and would have been in the hands of members but for unexpected delays.

An important event has marked the period of the Society's recess—the closure of the labours of the Compass Committee, in the formation of which this Society took the initiative. It is a matter of congratulation that their labours have been so highly marked by the government as to have had their last report ordered to be laid before both houses of parliament. The benefit which has resulted to science and to the mercantile interest by these operations, abundantly proves the value of suggestions and pursuits closely directed to a particular inquiry.

The donations made to the Society, between the months of June, 1856 and 1857, have been duly laid before the meetings and recorded in the minutes. Among these was a very liberal one from the executors and

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family of Joseph Brooks Yates, Esq., F.S.A., thrice the President of this Society. These volumes, together with the perfect volumes belonging to the Society, are deposited in the Society's apartments, and under easy regulations, are at the service of the members.

At the last meeting of the British Association the Society was well represented, the members present being received as a deputation.

The Treasurer's accounts, which will be laid before you, show the Society to be in a very satisfactory financial position.

In accordance with the laws of this Society, the retiring Council recommend the following members, in the room of the five who are not eligible for re-election: The Rev. John Robberds, B.A., Messrs. Grainger, B.A., Edward Fletcher, Robert Clay, and W. J. Lamport. They beg now to thank the members for their support, and solicit a continuance of their hearty co-operation in the pursuit of those elevating objects for which the Society is constituted.

(Signed) THOMAS INMAN, M.D., President.
DAVID P. THOMSON, M.D., Hon. Sec.

Royal Institution, October 5th, 1857.

The Treasurer's accounts were then submitted, from which it appeared that the outlay of the Society for the year had amounted to £115 1s. 1d., while the balance in hand was £210 1s. 5½d.

Mr. SWINTON BOULT remarked that the sum of £10 10s. set down as a charge for reporting the meetings, seemed to him unusual. He felt certain that the newspaper press would be happy to report the Society's Proceedings with as much fulness as was desirable, without any charge whatever. He should not object to the payment of the present sum, but should feel himself warranted in endeavouring to prevent it for the future.

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The SECRETARY explained that the charge was voted by the Society, according to usual form of having the subject twice before them, and on both occasions affirmed.

The report was adopted and accounts passed.

A ballot being taken for a new Council, the votes stood thus:—For the five new men—John Grainger, B.A. 15, Edward Fletcher 15, Robert Clay 15, Rev. John Robberds, B.A. 13, and W. J. Lamport 13; for the nine others—H. H. Higgins, M.A. 17, Isaac Byerley, F.L.S. 17, Dr. Thomson 16, J. B. Edwards, Ph.D. 16, W. Ihne, Ph.D. 15, T. C. Archer 15, Richard Brooke, F.S.A. 15, J. C. Redish 13, A. Higginson 10. The President's term not having expired, Dr. Inman continued in that office. The Vice-Presidents, Treasurer, and Secretary, were then elected, viz.—Rev. H. H. Higgins, M.A., T. C. Archer, W. Ihne, Ph.D., Vice-Presidents; Isaac Byerley, F.L.S., Treasurer; and David P. Thomson, M.D., Honorary Secretary.

The following donations to the Society were announced: Hansen's Tables de la Lune; Earl of Dundonald on the Bitumen of Trinidad; Reports of the Liverpool Compass Committee; Notices of the Royal Astronomical Society; Newlands's Report on Baths and Wash-houses; Proceedings of the Historic Society, vol. 9; Spencer's Report on the Corporation Water Works; Nevins and Edwards on the Rivington Water—several copies for distribution; Proceedings of the Linnæan Society; Ditto Zoological Society; Ditto Chymists' Association; Ditto Dublin Natural History Society; Ditto Dublin Geological Society; Report of the Warwick Natural History Society; Provincial Magazine, 4 parts.

RICHARD BROOKE, Esq., F.S.A., exhibited a curious antique bronze celt, considered to have been fabricated by the ancient Britons. He stated that celts were far from uncommon in Western Europe; and that he had seen many of them both in this country and in France;

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and that there was an excellent collection of them in Liverpool, in Mr. Mayer's museum—that antiquaries differed with respect to the use of them; some supposing that they were weapons, and others that they were implements used by the ancient Britons and other uncivilized tribes. He drew the attention of the meeting to the circumstance that, on each side of the one now exhibited, there were some slight attempts at ornamenting it, by small raised ribs or projecting lines; and that on one side of it there was a bronze loop (which was not uncommon in other celts), apparently intended to suspend it by means of a thong, or string, to the neck or belt of the person who carried it; all of which showed an advanced degree of skill in the workmanship, when compared with the very rude and ill-shaped celts found in some museums. He observed that moulds for casting celts have been discovered in this country; and that several of them are in the British Museum, in one of which, in consequence of some defect in the casting, there is a celt fast in the matrix.

Mr. Brooke also stated that the celt now exhibited was found in Northamptonshire, and was presented to him last May, when visiting for the second time Bosworth Field, by Mr. John Rubley, of Dadlington Fields, near there, whose kindness, in pointing out the various objects of interest connected with the battle, Mr. Brooke had occasion to mention to the Society, when reading his paper upon the "Field of the Battle of Bosworth."

Mr. Brooke likewise mentioned, as an interesting circumstance, that the ancient custom of tolling the curfew bell, still existed in some places in Lancashire and Cheshire, and that he had been told that Winwick was one of them; but that the custom was certainly kept up at Wilmslow, in Cheshire. He had had occasion, during many years past, to go occasionally into the neighbourhood

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of Wilmslow, and had very often heard it; and even as recently as last week he had repeatedly heard it. The curfew was always tolled there at eight o'clock in the evening, except Saturdays and Sundays. To accommodate the publicans, a deviation from the hour on those days had lately been made, and instead of eight o'clock, as formerly, it was now tolled at eleven in the evening of Saturday, and at nine in the evening of Sunday, in order to warn them to close their houses in Wilmslow.

Mr. T. C. ARCHER remarked that the curfew was regularly tolled in the cathedral at Chester, and other instances were cited by different members.

This concluded the business of the meeting.

SECOND ORDINARY MEETING.

ROYAL INSTITUTION, November 2nd, 1857.

DR. INMAN, PRESIDENT, in the Chair.

It was announced that the Council, in order to extend the usefulness of the library, had communicated with other societies, with a view to an exchange of publications, and had also made arrangements for the more free circulation of books among the members.

Referring to the bequest of the late Mr. Yates, including the Transactions of the British Association up to the year 1854, the SECRETARY mentioned that Dr. Inman had, in the handsomest manner, promised to continue the series during his own lifetime, he being a life-member of

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the Association. The intimation elicited a very warm acknowledgment from the members present.

An application for a subscription to a memorial to Jeremiah Horrocks, the astronomer, was referred to the Council. In the application, Horrocks was spoken of as "a hardworking curate," which, it was observed, decided the question which has been raised, as to whether he had ever been in holy orders or not.

Dr. THOMSON exhibited two ancient and valuable coins, found recently in Wiltshire. The one was a gold British coin, of such antiquity that its date was a matter of conjecture; the other was a Roman silver coin of Augustus, of very fine workmanship.

Mr. T. C. ARCHER exhibited a piece of siliceous conglomerate of the Eocene period, found at the junction of the Uraguay and Paraguay, in South America. It contained nodules of wood-agate, chalcedony, and opal, showing the district to be rich in minerals.

The REV. H. H. HIGGINS exhibited four specimens of fungoid plants, found in this neighbourhood, which attracted much attention, particularly *Lycoperdon giganteum*, from its enormous size, and *Peziza aurantia*, an undried specimen, on account of the extreme beauty of its tints. The others were, *Polyporus sulphureus*, and *Polyporus squamosus*.

Mr. SWINTON BOULT showed an elevation of a pianoforte manufactory at Boston, which employed four hundred hands, and turned out thirty-five instruments in a week, each requiring six months to perfect it; notwithstanding which, the supply was not equal to the demand.

The following paper was then read:—

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AN OUTLINE OF THE LIFE OF RICHARD NEVILLE, THE GREAT EARL OF WARWICK AND SALISBURY, CALLED THE KING-MAKER.

By RICHARD BROOKE, ESQ., F.S.A.

WARWICK—"For thou shalt know, this strong right hand of mine
Can pluck the diadem from faint Henry's head,
And wring the awful sceptre from his fist,
Were he as famous and as bold in war,
As he is fam'd for mildness, peace, and prayer."
Shakespeare's Henry VI., part 3, act 2, scene 1.

Richard Neville, the eldest son of Richard Neville, Earl of Salisbury, and Alice his wife, daughter of Thomas de Montacute, Earl of Salisbury, married Anne, daughter of Richard Beauchamp, sixteenth Earl of Warwick (by his second wife), and sister and sole heiress of the whole blood of Henry Beauchamp, Duke of Warwick, and in consequence of his marriage with her, and also on account of his services in war, Richard Neville, by patent of the 27th year of King Henry VI., obtained the title and dignity of (18th) Earl of Warwick, and as will be mentioned afterwards, he acquired various other titles, dignities, and offices, of great rank and importance.

The Earl of Warwick was one of the most powerful noblemen, whom England produced in the fifteenth century. He possessed vast property and wealth, was related or nearly allied to the principal and most influential of the English families of rank; and his own family (the Nevilles), reckoned amongst its members the most potent and warlike noblemen of the realm. The Earl of Warwick's grandfather was Ralph Neville, first Earl of Westmoreland, who died in the fourth year of Henry IV., and had by his first wife, Margaret, daughter of Hugh,

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Earl of Stafford, a son, John Lord Neville, who died before his father, leaving a son, Ralph Neville, second Earl of Westmoreland; and by his second wife, Joan, daughter of John of Gaunt, Duke of Lancaster, and widow of Sir Robert Ferrers, (first) Richard Neville, Earl of Salisbury before mentioned, (second) William Neville, Lord Falconberg, (third) George Neville, Lord Latimer, (fourth) Edward Neville, Lord Abergavenny, and (fifth) Robert Neville, Bishop of Durham; besides which he had by his second wife five daughters, four of whom married noblemen of high rank, and one became a nun; his fifth daughter, Cecily Neville, married Richard Plantagenet, Duke of York, the potent and formidable rival of King Henry VI., and the claimant of the throne of England. Richard Neville, Earl of Salisbury, by his wife Alice, daughter of Thomas de Montacute, Earl of Salisbury, had several sons, viz., Richard Neville, Earl of Warwick, the subject of this paper, (second) Sir John Neville, afterwards Lord Neville, afterwards Earl of Northumberland, and more recently Marquis of Montague, (third) Sir Thomas Neville, and (fourth) George Neville, Bishop of Exeter, afterwards Archbishop of York, and Lord Chancellor, and six daughters, all of whom married noblemen of great power and rank.

Besides the alliance of the Nevilles with the Duke of York, they were through him related by marriage to the great and potent family of Bourchier, the Duke of York's sister, Isabel, having married Henry Bourchier, Earl of Ewe, afterwards Viscount Bourchier, and afterwards Earl of Essex, and he, together with his brothers William Bourchier, Lord Fitzwarine, Thomas Bourchier, Bishop of Ely, and afterwards Archbishop of Canterbury, and a Cardinal, and John Bourchier, Lord Berners, were the sons of William Bourchier, Earl of Ewe, and Anne his wife, daughter of

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Thomas, Duke of Gloucester, sixth son of King Edward III., and widow of Edmund, Earl of Stafford, slain at the battle of Shrewsbury, in 1403.

The alliances of the mighty Nevilles, so far as they are material to the proper elucidation of the contents of this paper, will be found in the portion of the accompanying pedigree.

At the period when the Duke of York aspired to, and was cautiously taking his measures to obtain the crown, his principal confidential friends, through whose assistance and power he hoped to secure the prize which he coveted, were the Earl of Salisbury, the Earl of Warwick, and John Mowbray, Duke of Norfolk, between whom and the Duke of York there was a family connection, from the Duke of Norfolk's having married Anne Bourchier, sister of Henry Bourchier, Earl of Ewe, afterwards Viscount Bourchier, and afterwards Earl of Essex, and the latter having married Isabel, sister of the Duke of York, as before mentioned.

The Earl of Warwick had given repeated proofs of his valour, was warlike and talented in military matters, and was beloved by the soldiers.

He, like other powerful noblemen of England, in the feudal ages, could command the services, in war, of large bodies of retainers and vassals, and, as will be soon noticed, Warwick's power in that respect, caused him to be a most valuable ally, to any one whose cause he espoused, and a most formidable foe, to whoever he considered to be his adversary. He was liberal, generous, frank, and munificent; which qualities rendered him exceedingly popular.

With respect to his extraordinary hospitality, we have the authority of one of the most authentic of our old historical writers, that at the Earl of Warwick's house, in London, six oxen were usually eaten at a breakfast; and

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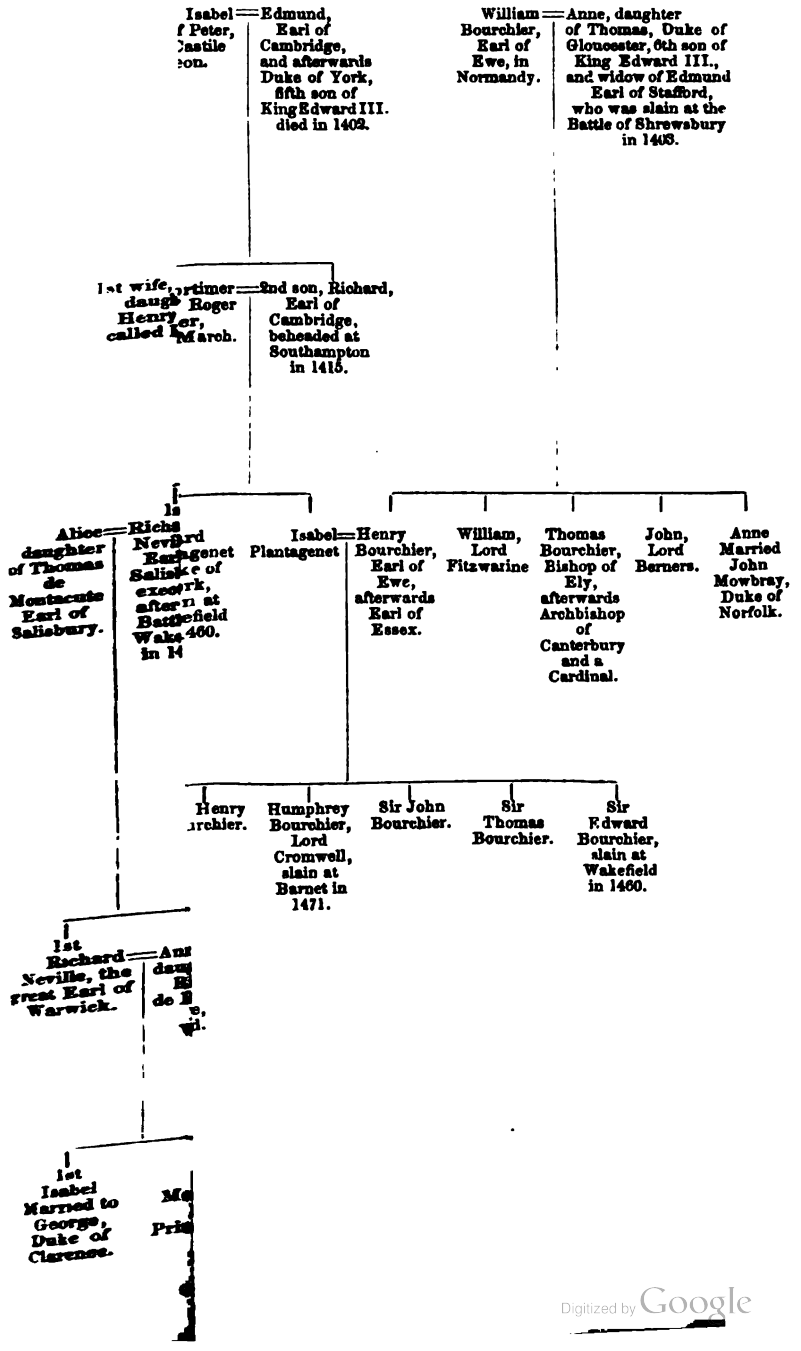
SE OF NEVILLE.


Isabel
f Peter,
Castile
eon.
Edmund, Earl of Cambridge, and afterwards Duke of York, fifth son of King Edward III. died in 1402.
William Bourchier, Earl of Ewe, in Normandy.
Anne, daughter of Thomas, Duke of Gloucester, 6th son of King Edward III., and widow of Edmund Earl of Stafford, who was slain at the Battle of Shrewsbury in 1403.
1st wife, daugh Henry called
Mortimer Roger Earl of March.
2nd son, Richard, Earl of Cambridge, beheaded at Southampton in 1415.
Alice daughter of Thomas de Montacute Earl of Salisbury.
Richa Neville Plantagenet Salisb exeter afterw Battlefield Wake 460. in M
Isabel Plantagenet
Henry Bourchier, Earl of Ewe, afterwards Earl of Essex.
William, Lord Fitzwarine
Thomas Bourchier, Bishop of Ely, afterwards Archbishop of Canterbury and a Cardinal.
John, Lord Berners.
Anne Married John Mowbray, Duke of Norfolk.
Henry rchier.
Humphrey Bourchier, Lord Cromwell, slain at Barnet in 1471.
Sir John Bourchier.
Sir Thomas Bourchier.
Sir Edward Bourchier, slain at Wakefield in 1460.
1st Richard Neville, the great Earl of Warwick.
Ann dau E de e, l.
1st Isabel Married to George, Duke of Clarence.
M Pri

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that every person who had any acquaintance with the family, might come to his kitchen, and take away as much sodden and roast meat as he wanted, and as he could carry upon a long dagger, to be consumed either at his own house, or at any tavern. These extraordinary circumstances, the splendour of his manner of living, his valiant and soldier-like qualities, his generosity, hospitality, and talents, as well as the general tenor of his conduct, made him the most popular man of the nation.

He was Admiral to King Henry VI., and was styled Great Captain of the Sea, having for his support in that office, not only all the tonnage and poundage belonging to the king, but a thousand pounds per annum out of the revenues of the Duchy of Lancaster. By the King's favour, he had a grant of pre-eminence above all the Earls of England; and moreover, to add to his greatness, a peculiar officer-at-arms, for his service in martial employments, called "the Warwick Herald."

We are much in the dark respecting the early life of the Earl of Warwick; the Baronages and Chronicles afford very little information upon that subject; nor is it at all clear where he acquired the knowledge of the art of war, and the capacity for military command, which afterwards distinguished him in the disastrous conflicts of York and Lancaster. He had, however, rendered valuable service in the wars of Scotland; and as his father, the Earl of Salisbury, was a commander of eminence, and served in the wars in France, it is not unreasonable to conclude, that the Earl of Warwick may have accompanied him to France, in some of the campaigns, and there acquired a knowledge of military matters, of which he had so many occasions to avail himself in the wars of York and Lancaster.

The Duke of York, having formed the scheme of dethroning King Henry VI., and of obtaining the crown of

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England, found it necessary for a considerable time to disguise his real intentions, and to profess a desire to reform what was amiss, remove evil counsellors, and correct abuses in the government; but during all that period he was in confidential communication with the Earl of Salisbury and Earl of Warwick, and principally relied upon their co-operation and power for the success of his enterprise.

After several important occurrences, connected with the weakness and incapacity of Henry VI., the conduct of his Queen, Margaret of Anjou, the Duke of York's having been at the head of the national affairs, and having acted somewhat in the nature of Regent or Viceroy during the King's illness, by the authority committed to him by the the Lords of the Realm, and his having been removed from that office after having held it a short time, which are scarcely within the scope and objects of this paper, Henry appeared with an army of Lancastrians at St. Albans, and the Duke of York marched thither at the head of an army of Yorkists. A battle ensued on the 22nd[1] of May, 1455, in which the Earl of Warwick commanded the vanguard of the army of the Duke of York, and entering the town through a garden, gave the first onset. The Lancastrians were defeated with great slaughter, Henry was wounded in the face with an arrow, and was taken prisoner.

Shortly afterwards a Parliament was summoned in the King's name, and the Duke of York was declared Protector of the Realm; the Earl of Warwick was appointed Captain of Calais, and the Earl of Salisbury was made Lord Chancellor. In 1456, Margaret and several of the noblemen of the Lancastrian party, formed a scheme to displace the Duke of York, and Henry, being in better health than he had previously been, came before the

(1) Some historians state that it was fought on the 23rd of May.

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Parliament, and discharged the Duke of York from the office of Protector. The Earl of Salisbury was removed from the office of Lord Chancellor. Sometime afterwards Margaret and some of the Lancastrian party, appear to have formed a scheme for getting York, Salisbury, and Warwick into their power; and being with Henry at Coventry, caused the King to send for them to that city. They proceeded accordingly towards it, but having received some intimation that danger awaited them there, they got away; York to his castle at Wigmore, in Herefordshire, in the Marches of Wales; Salisbury to his castle at Middleham, in Yorkshire; and the Earl of Warwick to Calais.

However, in 1458, King Henry, and Thomas Bourchier, Archbishop of Canterbury, and several other Bishops, being desirous to terminate the feuds between the partizans of the factions of York and Lancaster, overtures were made for a meeting, with a view to a reconciliation; and accordingly the great leaders of the rival parties met in London, in 1458. Warwick presented himself there, amongst the others, he having come over from Calais, and was attended by six hundred men, all wearing his livery, in red coats, with white ragged staves, embroidered before and behind. A hollow and transient appearance of reconciliation took place, and the great opposite leaders went together, in solemn procession, to St. Paul's Church, to celebrate the seeming termination of hostile feelings.

Not long afterwards, however, happened an affray, between a servant of the King and one of the Earl of Warwick's followers, and it gave colour to a report that there was a design to kill the Earl, which occasioned him to hasten to Calais, to make sure of that important place.

In the summer of 1459, Warwick brought over a body

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of veteran soldiers from Calais, and with them Andrew Trollope, an experienced commander,[1] who had served with great valour against the French, to a general rendezvous, which the Yorkists had appointed to be held at Ludlow. Salisbury, in marching to join them, gained a complete victory, on the 23rd of September, 1459, over the Lancastrians, in a battle at Blore Heath, and effected a junction with the Yorkists without further difficulty. The army of Henry and that of the Duke of York, then drew near to each other, the latter being encamped in Herefordshire, at Ludford, near the town of Ludlow, and a battle appeared to be all but inevitable; and the Earl of Warwick produced some persons publicly to swear that the King was dead, and caused mass to be said, and offerings to be made, in order that the Yorkists might have the less difficulty in taking the field.

A pardon was offered, in Henry's name, to such of the Yorkists who would lay down their arms; and Andrew Trollope, perceiving that the Duke of York was aiming at the crown of England, instead, as had been pretended, of rectifying misgovernment, and removing evil counsellors from the King, privately deserted the Yorkists, and taking with him a serviceable body of men, went over to the King; which so discouraged the Yorkist leaders, and not knowing how many others might follow his example, that they thought it expedient to disperse immediately; the Duke of York, with his second son, the Earl of Rutland, fled through Wales, into Ireland; and the Earls of March, Salisbury, and Warwick, hastened into Devonshire, where Sir John Denham provided ships for them, and they landed on 2nd of November, at Calais. Soon after this bloodless victory, King Henry called a parliament at Coventry, and the Earl of Warwick, and others of the

(1) He is called Sir Andrew Trollope by several historians, and it is probable, that he received the honour of knighthood, before his death at the battle of Towton.

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Yorkist leaders were attainted, and declared guilty of high treason.

The Government of Calais having been conferred by Henry's ministers, a short time before the affair of Ludford, upon Henry, Duke of Somerset, son of Edmund, Duke of Somerset, who had been slain at the first battle of St. Albans, in 1455, they were anxious to remove Warwick from it, but that was easier said than done; Somerset had a formidable adversary to deal with, and on approaching Calais, was repulsed by the cannon of the town, and prevented from entering the harbour. Warwick maintained himself there, with a considerable booty which he had acquired at sea, as Admiral, and which is said to have amounted not to less than the value of £10,000; for he had, after two days' fight, taken three vessels of Genoa, and two of Spain, laden with merchandize, with the loss of about a hundred men of his own, and a thousand of theirs.

Somerset being compelled, by the hostile reception at Calais, to land in another place, proceeded to Guisnes, but he was equally unsuccessful there, and had to send to England for succour. Warwick's good fortune still predominated, for Lord Rivers, and his son, Sir Anthony Woodville, afterwards Lord Scales, with ships and a body of men, were detained at Sandwich by contrary winds, and Warwick, having good information of what was going on, sent a body of land forces in some vessels, under the command of Sir John Denham, surprised Lord Rivers and his principal men, in their beds, one morning, and carried them away, with all their ships, to Calais.

Warwick soon afterwards sailed from Calais to Ireland, to confer with the Duke of York respecting their affairs, and as to effecting a landing in England; and on his return towards Calais, met the Duke of Exeter, lately made Admiral, who had been sent to intercept him; but

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Exeter, not liking to trust his own seamen, did not venture to encounter Warwick.

The Earls of March, Salisbury, and Warwick, soon afterwards landed in Kent, but still continued to profess loyalty to Henry; and the Earl of Warwick swore at the cross in Canterbury, that they had ever borne true faith and allegiance to Henry, and gave out that they only desired admission to the King, for the liberty of speech with him. Great numbers, of all ranks, joined them, and they were, on the 2nd July, 1460, received with cordiality into London, except into the Tower, which was for a short time defended by Lord Scales.

This success was soon followed up by something still more important; the army of the Earls of March, Salisbury, and Warwick, encountered that of Henry at Northampton, on the 9th of July, 1460; when a bloody battle ensued, at which Warwick had a principal command; the Lancastrian army was defeated, with great slaughter, Henry was taken prisoner, and conveyed to London. A parliament was called, and the Duke of York was once more appointed Protector of the Realm, and declared to be Henry's successor.

The battle of Wakefield afterwards took place, when the Duke of York was defeated, and lost his life, and the Earl of Salisbury was wounded, taken prisoner, and beheaded; but the tide of victory soon turned in favour of the other side, for the battle of Mortimer's Cross was shortly afterwards fought, when Edward, Earl of March,[1] the eldest son of the Duke of York, obtained a complete victory over the Lancastrians.

The Earl of Warwick was not present at either of those battles; but on Shrove Tuesday, the 17th of February, 1460–1, he and John Mowbray, Duke of Norfolk, having

(1) Historians usually call him Earl of March, but after the death of his father he had become Duke of York.

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King Henry with them at St. Albans, and having under their command an army of Yorkists, attempted to stop the progress towards London, of the Queen and her army of Lancastrians; a battle ensued, the Queen's forces obtained the victory, and delivered Henry out of the custody of the Yorkists. A junction was soon afterwards effected between the army of Edward and the portion of the Earl of Warwick's forces that had escaped from the battle of St. Albans. The Queen was refused admittance into London, and she consequently retired with the King and the young Prince of Wales towards the north, and Edward, with the Yorkists, entered London without any opposition; where, on the 4th of March, 1460–1, he was proclaimed King, by the title of Edward IV.

On the 7th of March the Earl of Warwick and a large portion of the Yorkist army marched from London towards the north; and on the 12th, Edward and the remainder of his army also left London, in order to encounter and fight the army of Henry; and the important and sanguinary battle of Towton, at which Edward and the Earl of Warwick commanded the main body,[1] was fought by the rival armies on Palm Sunday, the 29th of March 1461, when the Lancastrians were completely defeated, with prodigious slaughter, and which established Edward for a considerable time upon the throne of England. He was crowned King at Westminster, with all the usual forms and ceremonies of the Sovereigns of England, on the 20th of June following; after which there was nothing of honour, authority, and benefit that the new King could bestow, and which the Earl of Warwick desired, but he obtained it. He was soon made

(1) I do not consider it necessary to notice the statement which is to be found in some authors, that the Earl of Warwick stabbed his horse, upon hearing of a disaster having occurred to Lord Fitzwalter and his forces at Ferry Bridge; the tale is an improbable one, and he, as a soldier, most likely knew the value of a war horse too well, to destroy it wantonly or foolishly.

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Captain of Calais, and of the Tower of Risebank, and Lieutenant of the Marches there, and Governor of the Castle of Guisnes. The latter he bound himself to keep as long as he lived, with forty-eight men-at-arms on foot; himself and his Lieutenant on horseback, and fifty archers on foot.

He was likewise constituted General Warden of the East Marches towards Scotland, Lord Great Chamberlain of England for life, Constable of Dover Castle, and Lord High Steward of England. Besides which, in recompence of his many and great services, he obtained a grant in fee of the Manor of More End, in Northamptonshire, and of the Manors of Atherstone and Fulbroke, in Warwickshire. In 1462 he was made Constable of the Castle of Hammes, in the Marches of Picardy, to be held by himself or his deputy for the term of his life; and to have there one archer on horseback, and seventeen men-at-arms on foot, and also seventeen archers.

Besides Warwick's own lands and possessions, which were great, he had many lordships granted to him, as well crown lands, as lands forfeited by attainders of the Lancastrians, and had also several great offices conferred upon him; so that it has been stated that his revenues were valued at fourscore thousand crowns per annum, besides his own inheritance.[1]

It does not appear very clearly what first caused a coolness between King Edward and Warwick, but some historians have stated that Warwick was employed by Edward to treat with Louis XI., King of France, for a marriage between Edward and the Lady Bona, daughter to Louis Duke of Savoy, sister to the French Queen, and that he received a favourable reply; but that in the meantime it happened that Edward, taking the recreation of hunting in Wychwood Forest, near Stoney Stratford, visited

(1) Phillippe de Commines. Book iii., chap. iv.

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the Duchess of Bedford, at her residence at Grafton, in Northamptonshire, and there saw Elizabeth, the widow of Sir John Grey, who lost his life on the Lancastrian side, at the first battle of St. Albans, and that Edward was so captivated with her beauty, that he eventually concluded to marry her.

It has been said, that after King Edward had obtained the crown, through the power of the Earl of Warwick, suspecting danger by his greatness, he endeavoured to diminish his power, which being discovered by Warwick, he sought every opportunity to work the King's ruin; and also that Warwick having used many arguments to dissuade the King from giving his sister Margaret in marriage to Charles, son of Philip, Duke of Burgundy, he felt aggrieved that he could not prevail. Whatever it might be that caused the breach between King Edward and Warwick, several years elapsed before their disunion became apparent to the world.

In 1463 the Lancastrians, under Queen Margaret, again attempted to make head in the north against King Edward, who laid siege to the Castles of Alnwick, Bamborough, and Dunstanborough; the two latter capitulated on Christmas Eve, and in January, 1464, Alnwick surrendered to the Earl of Warwick. Edward in the same year empowered the Earl of Warwick, and John Neville, Earl of Northumberland, afterwards Marquis of Montague, to receive all rebels concerned in the disturbances in the north, to mercy (with one or two exceptions), upon their submission. Warwick laid siege to the Castle of Bamborough, and his cannon beat down a tower, and in its fall it so injured the Governor, Sir Ralph Grey, that he was taken up for dead, and afterwards executed, and the garrison surrendered the Castle. Warwick then marched to Berwick, took the town, burnt one or two places in Scotland, and by those hostilities accelerated the conclu-

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sion of a truce with Scotland for fifteen years. King Henry was soon afterwards captured, and sent as a prisoner to London.

In 1465 the Earl of Warwick and Lord Wenlock were sent to France, to treat with the agents of King Louis XI., respecting a peace; and in the same year he was joined in commission with the same Lord Wenlock, and others, to treat with Philip, Duke of Burgundy, concerning a mutual trade between the English merchants and those of that Duke; and was at the same time empowered to treat with the Duke of Brittany respecting a league of peace and amity. He was also joined as Commissioner with Lord Hastings, then Lord Chamberlain of the King's household, to treat and conclude, with James Luxenburgh, Lord of Richbourgh, the King's uncle, respecting a league of amity between Charles of Burgundy, Earl of Charolois, and King Edward. He was constituted one of the Commissioners to treat with those from the King of Scotland, upon several grievances brought forward on the part of the subjects of that realm, contrary to the truce made between both Kings. In 1467 he was employed, with Lord Hastings, to confer with Charles, Earl of Charolois, or his agents, respecting a marriage, which was afterwards concluded, between that Earl and Margaret, King Edward's sister; and also to treat of peace with the French King's Ambassadors.

After the marriage of King Edward, the favours and honours lavished by him upon the relations of the Queen, the Widevilles or Wodevilles, rendered them odious to the nation, and added to the dissatisfaction in the mind of the Earl of Warwick; and there are some historical writers who state that that feeling was greatly influenced by Edward's having entertained dishonourable intentions with respect to a daughter of Warwick. The first effects of Warwick's discontent were not publicly known,

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nor until about 1469, when, being in Warwickshire, he sent for his two brothers, George Neville, Archbishop of York, and John Neville, Marquis of Montague, at which time he communicated to them his reasons for the restoration of King Henry, and soon won them to his views. Taking advantage of some feeling of discontent which George, Duke of Clarence, the King's brother, entertained, Warwick allured him to his side, and in order to fix him more strongly in his interests, gave him Isabel, his eldest daughter, in marriage, with half the lands of her mother's inheritance, and the marriage was solemnized in the Chapel of our Lady, at Calais.

In 1469 an insurrection broke out in Yorkshire against Edward, which was soon followed by a battle fought at Edgecote, in Northamptonshire, but near Banbury, and from that circumstance called the battle of Banbury, where the royal forces were defeated. It is not certain that Warwick was implicated in this insurrection, although it is probable that he was privy to, or encouraged it. He shortly afterwards came over to England, with the Duke of Clarence, and Edward thought it necessary to keep fair with them, but seems to have formed schemes for depressing their power, and to draw off Warwick's brother, John Neville, Earl of Northumberland, afterwards Marquis of Montague, from their party, by dazzling him with the hopes of a marriage between his son, George, Duke of Bedford, and Edward's daughter, the Princess Elizabeth. About this period, however, according to several historians, the Earl of Warwick and the Duke of Clarence succeeded in surprising King Edward in the night, and causing him to be conveyed to Middleham Castle, in Yorkshire, and left in the custody of the Earl's brother, the Archbishop of York; but Edward, having been allowed the diversion of hunting in the park, which the Archbishop permitted, made his escape.

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Historians are, however, far from agreeing whether such a circumstance ever occurred; and there are some writers of credit and research, who confidently dispute it.

We have, however, a very high authority in Phillippe de Commines, a historical writer of great celebrity of that age, who was personally acquainted with Edward IV., and who mentions in the clearest terms, not only the capture and custody of Edward, but his subsequent escape:—"En effect j'ay veu en ce temps ou peu avant, le Comte de Warwic si fort, qu'il mit le Roy, son maistre, entre ses mains," &c. &c. * * * *

* * * * * *

"et garda le Roy son maistre une espace de temps honnestement; et luy mit nouveaux serviteurs à l'entour, pour luy faire oublier les autres; et luy sembloit que son maistre estoit un peu simple. Le Duc de Bourgongne eut grand doute de ceste adventure, et pratiquoit secrettement que le Roy Edouard peust e'chaper, et qu'il eust moyen et façon de parler a' luy; et tant allerent les choses, que le dict Roy Edouard e'chapa, et assembla gens, et' detroussa quelques bandes de ceux du dict Comte de Warwic."(1)

Another very strong reason for our believing that it occurred, is to be found in the act of attainder passed against the Duke of Clarence, in which, amongst various other accusations against him, he is charged with having formerly put King Edward's person "in straite warde, puttying hym thereby from all his libertie;"(2) which it seems very difficult, if not actually impossible, to apply to any other circumstance than his detention in custody.

Another insurrection against Edward soon broke out in Lincolnshire, and Edward proceeded in person against the insurgents; and obtained a complete victory over them in

(1) Phillippe de Commines. Book iii., chap. iv.
(2) Rot. Parl. 17 Edward IV., (1477). Vol. vi., fo. 193.

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battle, at Horn, five or six miles from Stamford, but in Rutlandshire, and near the borders of Lincolnshire. The battle is called by several names, as the battle of Stamford, Hornfield, and Losecoat Field. Warwick and Clarence had assembled forces, and appear to have intended to have joined the insurgents, but their too hasty proceedings prevented the design of the former. Warwick and Clarence then proceeded into Lancashire, in hopes of being joined by Thomas, Lord Stanley, who had married Warwick's sister, but were disappointed by Stanley's refusal; and not being able to effect anything against Edward, as they had hoped, in Yorkshire, they found it requisite to provide for themselves in all haste, proceeded to Devonshire, obtained ships, and embarked at Dartmouth. They sailed towards Calais, of which town Warwick was Captain; but Vauclerc, a Gascon gentleman, whom he had constituted his Lieutenant there, opposed his entrance, and the cannon of Calais fired upon him, although he privately gave reasons to Warwick, to excuse his conduct.

The Duchess of Clarence was delivered of a son, afterwards the unfortunate Edward, Earl of Warwick, and it was with difficulty that they got permission for the infant to be christened at the church in the town, and obtained two flaggons of wine for the refreshment of the ladies, who were sick on board. Warwick then landed in Normandy, and receiving much countenance from the French King, applied himself to Queen Margaret (wife of King Henry VI.), who had fled thither for safety; and Warwick, the better to unite his and the Lancastrian interest together, matched his daughter Anne to Edward, Prince of Wales, son of Henry VI. and of Queen Margaret, taking a solemn oath to restore King Henry; by which course he obtained no small assistance from the Queen's friends.

There were many reasons for surmising that a league so formed, between Margaret, Warwick, and Clarence,

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contained too many manifest elements of discord to last long. Clarence, by supporting Margaret, and taking measures for the restoration of Henry, and the ultimate succession to the crown of the Prince of Wales, was uniting himself to the greatest enemies of his family, was acting contrary to his own interests, and was virtually excluding himself and his children from the chance of succeeding to the throne. King Edward was too sagacious not to try to open the door to a reconciliation with Clarence; and as negotiating by means of a female, could be effected with less suspicion, than would have been excited if a man had been sent over to Clarence, a trustworthy and talented lady was sent to France, ostensibly to the Duchess of Clarence, but with secret instructions to induce Clarence to desert the party of Warwick, and to rejoin that of Edward; and she so cleverly executed the commission, that notwithstanding Clarence was the son-in-law of Warwick, in consequence of having married Isabel his daughter, Clarence promised that at a convenient opportunity he would desert Warwick and join Edward. Warwick was completely ignorant of what was arranged, and fully relied upon the co-operation of Clarence.

Warwick and Clarence landed shortly afterwards in the West of England, and proclaimed King Henry. Warwick's power and popularity were so great, and such numbers came in to him, that he had soon a large army under his command; and King Edward was forced to fly and go abroad, and try and obtain some aid from Charles, Duke of Burgundy, who had married his sister. Warwick entered London in October, 1470, delivered King Henry out of the tower, and set him again upon the throne.

After Henry's restoration, Warwick virtually ruled the kingdom in Henry's name, and was made Lord High Admiral of England.

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Phillippe de Commines having been sent to Calais, by the Duke of Burgundy, to treat with Vauclerc, reports that Warwick was so popular, that every one wore his badge, no man esteeming himself in the fashion who was not adorned with the ragged staff; nor was any door frequented that had not his cross painted upon it; and that Vauclerc himself wore in his hat a jewel, upon which was a ragged staff, embroidered with gold.

The Earl of Warwick's power, although then great, was exceedingly transient; for in a very few months another revolution occurred, as sudden as the last. Edward returned, with some few forces and friends, from the Continent, landed at Ravenspur, in Yorkshire, and entered the city of York. He proceeded southward from thence, his army greatly increasing on the way, and presented himself before Coventry, where Warwick was strongly posted with his forces, awaiting the expected arrival and junction of the troops under his brother, the Marquis of Montague, and his son-in-law, the Duke of Clarence. Warwick, under those circumstances, did not then choose to engage in battle, and Edward marched on towards London, which Warwick expected would hold out until he could arrive to its relief; and he accordingly commenced his march in that direction. Disastrous tidings, however, soon reached him. He soon received the intelligence that Edward had been joyfully received into London; that Clarence had deserted the Lancastrian party, and had gone over, with all his army, and joined Edward near the town of Warwick; and that Henry, instead of being a King, was a prisoner.

Warwick was now in a situation of great danger; he was too far advanced to retreat, with much chance of success; was a considerable distance from any place of safety; and was in the face of a superior army; and although Clarence offered his mediation between Edward

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and Warwick, the latter was too proud and spirited to accept his intervention, but indignantly rejected it, and prepared for battle. Warwick's army was encamped at a place then called Gladmore Heath, now enclosed, on the north-westward side of Barnet, from which it is distant about a mile, and just beyond the small village of Hadley, in the county of Middlesex, but very near the borders of Hertfordshire. Edward had advanced with his army from London to Barnet, and passing through it, encamped and passed the night prior to the battle in the open field, near the forces of Warwick.

On Easter Sunday, the 14th of April, 1471, the battle of Barnet was fought between the rival armies, and terminated in a complete victory obtained by the Yorkists over the Lancastrians; in which the Earl of Warwick, the Marquis of Montague, many knights and gentlemen, and a great number of common soldiers, were slain. Phillippe de Commines informs us that Warwick never used to fight on foot; but his practice was, when he had led his men to the charge, then to take horse, and if victory fell on his side, to fight amongst his soldiers, otherwise to depart in time; but that at this battle, he was induced by his brother, the Marquis of Montague, to alight on foot, and send away his horse.

The bodies of Warwick and the Marquis of Montague were conveyed in a cart to London, and exposed to view in St. Paul's Cathedral Church for three days, in order that no doubt might exist as to their deaths; they were then buried in Bisham Abbey, in Berkshire, which had been founded or endowed by an ancestor, one of the Montagues: the Abbey was destroyed at the dissolution of Monasteries; their tombs were broken, and all knowledge of the exact spots where their mortal remains were interred, is now utterly forgotten.

So terminated the career of the great Earl of Warwick,

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one of the most valiant and powerful noblemen that England has ever produced, and one who has been correctly described as the "the proud setter up and puller down of Kings;"[1] the correctness of which observation is evinced, by his having been mainly instrumental in dethroning Henry VI., and making Edward IV. a King; and again in dethroning Edward and restoring Henry.

"*Warwick (wounded).*—For who liv'd King, but I could dig his grave?
And who durst smile when Warwick bent his brow?
Lo, now my glory smear'd in dust and blood!
My parks, my walks, my manors that I had,
Even now forsake me; and of all my lands,
Is nothing left me but my body's length."
Shakespeare's Henry VI., Part 3, Act 5, Scene 2
(A Field of Battle near Barnet.)

The following paper was then read:—

ON SOME OF THE MINOR NATURAL HISTORY EXCURSIONS MADE DURING THE LAST MEETING OF THE BRITISH ASSOCIATION.

By T. C. ARCHER, Esq., V.P.,
Professor of Botany, Queen's College.

Every naturalist is aware of the value of actual work in the field, but it is not always easy to convince the fireside student that more may frequently be gained in a few walks with accomplished masters of natural history, than can be acquired by years of study assisted by books alone. Indeed it is almost impossible to over-estimate the value of "field days" to the really ardent naturalist, especially when these pleasant and healthful studies are shared by agreeable companions.

(1) Shakespeare's Henry VI., Part 3, Act 3, Scene 3. It is remarkable, that in the same Tragedy, in Act 2, Scene 3, Shakespeare conveys the same sentiment, but in different words—"Thou setter up and plucker down of Kings."

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Believing that the utility of field operations is not fully appreciated, I am induced to place before you a sketch of three minor natural history expeditions, made during the last meeting of the British Association in Dublin. The first was under the direction of Dr. Allman, Professor of Natural History in the University of Edinburgh, a worthy successor to Professor Edward Forbes, both in talent and that *bonhommie* which made the late Professor as much beloved, as his extraordinary genius caused him to be respected. We met in Sackville Street, at eleven a.m., our object being to occupy the time until two p.m., by exploring the localities in which Dr. Allman had discovered and studied the species of fresh-water polyzoa, which he has so fully described in his masterly monograph. Our party consisted of Dr. Allman and his brother, Professor Redfern, the Rev. H. H. Higgins, the Rev. H. Wood, F.G.S., Dr. J. B. Edwards, and myself. We first directed our steps to the Dublin canal. Here most of us were astonished at the green colour of the water, differing altogether from the greenness which results from stagnation. It appeared to be almost filled with green fusiform spiculæ, each freely floating. Upon examination, these proved to be the curious little fresh-water confervæ, Aphanizomenon incurvum and A. flos-aquæ, the Spherozyga spiralis of some authors, and Trichormus spiralis of Allman. For at least half a mile, which we went along the banks of the canal and around the docks and basins, we saw this little plant in countless millions, generally free as before mentioned, but occasionally aggregated into masses, apparently where it had clung to the walls or projecting weeds. These clusters had a bright apple-green colour, and appeared smooth and compact, reminding us of the curious *Nostochinæ*, but upon the slightest touch the frustules were disunited, and floated away independently,

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We drew water in our specimen bottles from various parts of the canal, all of which contained the confervæ. In about an ounce of the water, otherwise beautifully clear, I counted 150 separate plants. This would give 19,200 specimens of these confervæ to each gallon of the water contained in many miles of this canal.

One of the principal points to which Professor Allman guided our steps was a bridge, under which the Fredericella Sultana of Blumenbach and others, was very abundant in the crevices of the masonry, about eighteen inches below the surface. These crevices were beautifully fringed with the aquatic moss Fontinalis antipyretica (Linn), and patches of the emerald-green Spongillia, amongst which the brown, unattractive moss-like bunches of Fredericella were very abundant. This curious and beautiful animal, now placed in close alliance with the mollusca, consists of a ramifying brown tubular cœnœcium, of a nature similar to that which contains the polyps in Sertularia and other genera. It consists, however, of two distinct membranes, the inner termed the endocyst, the outer the extocyst. From the orifices terminating the branches of these double tubes the beautiful polypide is protruded or retracted at pleasure, and when expanded is distinctly perceptible to the naked eye.

The remainder of the morning was consumed in an unsuccessful search for the beautiful Cristatella, which the same locality had previously yielded plentifully to Dr. Allman's researches. Near the bridge from which we commenced our explorations, we saw what, if not interesting in a natural history point of view, certainly offered food for reflection; a large pile of tan or exhausted tanner's bark, protected from the weather by a temporary covering, formed of some of the beautiful semicircular girders of the roof of the Dublin Exhibition Palace—that splendid roof which formerly spread its ample span over

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the choicest productions of art, and over the most brilliant throngs of Ireland's beauties and her hospitably entertained visiters—was here degraded to the base purpose of protecting a dunghill. Our morning's excursion had lasted three hours, and I am satisfied that they were neither idly nor uselessly spent. We had seen a phenomenon of vegetation in the Aphanizomenon, most stupendous in its details; one single species had met our eyes in such inconceivable numbers, that it is not extravagant to assume that the individuals in the space we examined, far exceeded in number all the phenogamous plants of the world! Besides which we had familiarised ourselves with the ordinary aspects of Fredericella Sultana, and seen its habitats, and thus acquired an interest in it and all its beautiful congeners. This, in addition to the pleasures of intellectual society, was no mean acquisition for three hours. If the rest of our lives had been similarly spent, we should all have been wiser, if not better men.

Having paid attention to ourselves—a duty incumbent upon all field naturalists—and being thoroughly invigorated we proceeded to the Kingstown and Dublin Railway Station, and joined a large party, consisting of nearly fifty, under the direction of Professor J. B. Jukes, the director of the geological survey of Ireland. We proceeded by train to the station of Killiney, where we left the carriages and examined the section formed by the railway cutting, which makes a complete escarpment of a considerable portion of the hill continuous with the face of the cliffs. The railway, I should suppose, is fully two hundred feet above the shore, and abundant examples may be seen of protruded granite and granite veins, this rock being here always in contact with lower Silurian slates. The railway continues on to Bray, and passes in its course through the bluff called Bray-head. The

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tunnel is cut through the Cambrian Rocks, and appears from the Hill of Killiney like a white spot on the side of Bray-head, the light being distinctly seen at the farther extremity. It is in this tunnel and the adjacent cuttings that Professor Kinnahan, one of the most active and indefatigable of the Dublin naturalists, has discovered in great abundance the curious and interesting fossil Oldhamias, the oldest of all created animals which have left traces of their past existence, like an elegant vignette, imprinted on the first leaf of that Great Book which has existed from the beginning, and whose pages contain a faithful record of the past, written by a hand which cannot err—His who created all things.

From the railroad we descended to the beach, over immense masses of granite, forming rocks of the grandest appearance, on whose surface, wherever a small quanity of soil was collected, were growing plants in bloom of the beautiful Aster tripolium (L.), usually found in marshy places near the sea-shore, but here growing in greater luxuriance and beauty than ever we saw before. So also the Statice limonium (L.), another salt marsh plant, was growing with extraordinary luxuriance. Plantago coronopus, (L.) grew in every crevice, and many of the precipitous faces of the cliffs glittered in a golden and emerald mantle of samphire, (Crithmum maritimum, L.) Asplenium maritimum produced its fronds luxuriantly in the deeper crevices, whilst nearer the shore a carpet of the pink Armeria maritima (Willd.), formed an agreeable relief to our feet after scrambling over the sharp rocks. Amongst the blocks of shingle on the shore we saw a large quantity of water-worn fragments of Micaceous Schist, in which crystals of Chiastolite of considerable size and beauty were profusely imbedded. After an interesting exploration of the beach, which would have furnished ample materials for days instead of

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minutes, we re-ascended to the railway, and continued our ascent above it. One small field through which we passed was pointed out to us by Professor Kinnahan and Mr. Kelly as one of the very few localities in Ireland in which the beautiful and sweet-scented little orchid Neottia spiralis, (L.) is found; we procured an abundance of good specimens very easily. Our progress was now across stone fences, hedges, and other obstructions, until we came to a saddle-back protrusion of granite, which extended as a bare ridge about a yard high, and the same width, through several small fields; and our excellent director pointed it out in various other parts of the hill in a diagonal line from our halting place. Continuing our walk we soon found ourselves amongst enormous masses of granite, scattered about in wild confusion over a comparatively flat space, which formed the summit of the hill. The vegetation here was only the heather and gorse, and such weeds as usually accompany them in stony moors. Our labour in reaching this spot was now repaid by one of the most beautiful views imaginable—a valley of surpassing loveliness was spread at our feet, the luxuriant crops of ripened grain glittering in the sun, fully warranted the appellation of the Golden Valley, by which name we were told it was known. The range of mountains, beginning with the Head of Bray and the peaks called the Golden Spears, bounded the valley on the opposite side, and stretched far away through Wicklow. To our right the green waves of the glorious Bay of Dublin rolled upon the narrow band of sand and shingle, which separated its waters from the luxuriant meadows of the valley, giving rather the idea of a rich garden watered by a quiet stream than a spread of sea coast, usually so bleak and barren.

Many portions of the space on which we stood were entirely bare, the granite being almost polished by the action

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of the wind and other causes; here we saw some most instructive examples of injected granite in small veins which came to the surface, filling up what had evidently been fissures in the older rock; then, upon following Professor Jukes down the side of the hill towards Bray, past a large quarry, we came to a considerable depression running obliquely towards the sea-shore, forming an immense smooth groove. Here he pointed out to us the unmistakable marks of glacial action; the sides were of bare granite, polished and grooved deeply by the action of the descending glacier, which had evidently moved seaward down this ice-worn channel, for the Professor also shewed us an excellent section of the dirt-bed which it had projected over the cliffs on the shore—the section being made by the railway cutting passing through it. Re-ascending, we now directed our steps towards the higher peak, called Observatory Hill, upon which is placed a monument, and skirting along its side, passed through the beautiful grounds and by the magnificent castellated mansion of Mr. Warner, with his kind permission.* We returned to the railway station to await the train which was to convey us back to Dublin. On our way we saw some very interesting examples of slate in contact with granite, and procured good illustrative specimens. Dr. Allman found a remarkably fine specimen of the Felspathic mineral Spodumene embedded in granite.

This finished a day of great interest to all, and we returned to our homes fully satisfied with the pleasures we had enjoyed and the knowledge we had so agreeably gained. The time occupied in the latter excursion was six hours, from two to eight p.m.

Two days afterwards, a small excursion party was

* Let no one who has the opportunity of ascending from Kingstown to the Obelisk lose it. The view is one of the grandest which can be obtained, and will long be remembered. EDITOR.

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again organized for an aquatic trip. It consisted of Professors Allman, Redfern, and Kinnahan; the Rev. P. P. Carpenter, of Warrington; Dr. Edwards, Mr. Hyndman, Mr. Robert M'Andrew, his son, and myself. To Mr. M'Andrew, our sincerely esteemed friend and late president, we owed the pleasure of this excursion, which was made in his beautiful commodious yacht, the "Naiad," furnished with all the apparatus necessary to the marine zoologist, such as dredges, nets, &c. Besides providing for our creature comforts in the most liberal manner, our host gave us the full benefit of his great experience in dredging matters, and treated us with a degree of kindness, which I am sure I may say for all, will never be forgotten. We had so slight a breeze that, whilst busily engaged at breakfast, we glided out of the harbour without being aware we had left the anchor. The wind, however, freshened, and we soon lost sight of land. Our course was for the Kish Bank, which we reached by noon, and the dredge was lowered; it grated along as a naturalist loves to feel it, over a rough bottom, which proved to be a bed of Escallops (Pecten maxima), great numbers of which were brought up at each haul of the dredge. The results of our operations will be shewn by my giving you the names of the specimens we procured.

Of Mollusca we dredged:—

Saxicava arctica,
Corbula nucleus,
Thracia phaseolina,
Solen siliqua,
—— pellucidus,
Solecurtus candidus,
Psammobia Ferroensis,
———— tellinella,
Tellina tenuis,
——— fabula,
Syndosmya alba,
———— prismatica,
Donax anatinus,
Mactra stultorum,
——— elliptica,
Tapes virginea,
Venus striatula,
——— fasciata?
Artemis lineta,
——— exoleta,

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Cardium echinatum,
——— fasciatum,
——— Norvegicum,
Lucina borealis,
Montacuta ferruginosa,
Modiola modiolus,
——— barbata?
Nucula nucleus,
——— nitida,
Pecten varius,
——— pusio,
——— tigrinus,
——— maximus,
——— opercularis,
Ostrea edulis,
Anomia ephippium,
——— patelliformis,
Chiton cinereus,
——— asellus,
Dentalium entalis,
Pileopsis Hungaricus,
Emarginula reticulata,
Trochus cinereus,
——— tumidus,
Rissoa striata,
Turritella communis,
Natica monilifera,
——— nitida,
Purpura lapillus,
Nassa incrassata,
Buccinum undatum,
Fusus Islandicus,
——— antiquus,
——— propinquus,
Mangelia turricula,
——— brachystoma?
Cyprea Europea,
Doris argo.

Of Annelida:

The curiously beautiful sea-mouse Aphrodita aculeata, also Terebella conchilega, Sabella tubularia, and Serpula contortuplicata.

Of the Crustacea, belonging to *Decapoda Brachyura:*

Three specimens of the long-legged spider crab—Stenorynchus phalangium.

Many specimens of Hyas coarctatus (Leach).

Five specimens of Eurynome aspera (Leach).

Two specimens of the cleanser swimming crab—Portunus depurator (Leach).

Two of the livid swimming crab Portunus holsatus, and many of the dwarf swimming crab—P. pusillus.

Of the common pea crab, Pinnotheres Pisum, we only found one specimen.

Of the *Anomourous Decapods*, many Paguri were found—

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P. Bernhardus—the common hermit crab.

P. Cuanensis (Thompson.)

P. Hyndmanni *(Ibid)*, named after our comrade, Mr. Hyndmann.

P. Thompsoni.

Many were also found of the pretty minute porcelain crab —Porcellana longicornis (Edw.); and Galathea—Galathea Andrewsi (Kinnahan.)

Of the *Macrourous Decapods*, we found the channel-tailed shrimp.

Crangon Almanni (Kinnahan), one specimen.

Of the genus Hyppolyte:

H. Varians (Leach), one specimen.

H. Thompsoni (Bell), one specimen.

H. Pusiola (Kroyer), two specimens.

This was the extent of our collection of crustaceans, and it will be observed that, of this number, two were named after two of our companions, and three others were species, so recently made known to science, that our friend Professor Kinnahan, also of the party, had named them.

Of Echinodermata, we obtained several species, and many very fine specimens.

We procured several specimens of the common Egg Sea Urchin—Echinus sphœra (Müll.), and the Purple-spined Sea Urchin—E. Millaris (Leske).

Three dead specimens of the little Pea Sea Urchin—Echinocyamus pusillus (Müll.).

Three fine specimens of the Purple-heart Sea Urchin—Spatangus purpureus (Müll.).

Four of the Common-heart Sea Urchin—Amphidotus cordatus (Penn). Of the Star-fish division we procured two specimens of the common Sand-star—Ophiura texturata (Lane), and numerous specimens of the following species of Ophiocoma:—

O. neglecta (Forbes) Gray brittle star.

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O. granulator (Link) Granulated brittle star.
O. Bellis (Do.) Daisy.
O. Rosula (Do.) Common.

Of the genus Uraster we procured—

U. rubens (Linn.) Common cross fish.
U. hispida (Fenn.) Little ditto.

We found large quantities of the very common alconium constantly in the dredge;—A digitatum, called Dead man's fingers.

We did a little in Icthyology, for we enjoyed the sports of the beautiful little Mackarel midge in a basin where it darted about like a living crystal of berryl, its brilliant green back glittering in the sun. Some small specimens of Cyclopterus lumpus, the lump sucker, were also taken; and Dr. Edwards, trying to while away certain troublesome qualms which affected some of the party, began fishing, and caught a fine gurnard (Trigla). Numbers of medusæ floated by, and the water in our basins was occasionally full of the lovely Cydippe.

Of the feathered tribe we saw many species, but our attention was otherwise engaged and no notes were made; but I was much struck with the extraordinary number of sea-birds' feathers we saw floating in patches from time to time. At five o'clock p.m. we again reached our anchorage, and bade farewell to our kind entertainer, for whose kindness I cannot be sufficiently grateful. I was an invalid during the whole day, and received from him an amount of delicate attention in consequence, which I shall never forget.

My object in the present paper has been to shew how much of nature and natural history can be seen in an excursion to the proper fields, and, by so doing, to stimulate the members of this Society to a more united and energetic action in gleaning the beauties of our own locality.

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The CHAIRMAN referred to the glacial action in the neighbourhood of Killiney Hills, which extended a considerable distance into Wicklow. On visiting the Seven Churches he had been surprised to find so many evidences of glacial action. All persons who visited the district, whether geologists or not, were struck with the immense number of large boulder stones—blocks of granite lying on the surface of the ground, though there was not a single mountain near.

Mr. ARCHER thought it more probable that these blocks had been deposited by drift ice or icebergs, than by. glaciers. The effects to which he had referred were distinctly those of glaciers.

This terminated the business of the ordinary meeting.

An EXTRAORDINARY MEETING was then held, to consider the expediency of continuing the payment of ten guineas a-year for official reports of the Society. It came before the meeting as a recommendation from the Council. Several members spoke in the highest terms of the success of the experiment, and the manner in which the reports had appeared, applauding both the medium of publication, and those who were instrumental in producing the reports. The motion was carried by sixteen to one.

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THIRD ORDINARY MEETING.

ROYAL INSTITUTION, 16th November, 1857.

THOMAS INMAN, ESQ., M.D., PRESIDENT, in the Chair.

The following were elected Ordinary Members :—

JOSEPH COOPER, Esq., Alderman.

JAMES ELLIOT, Esq., Professor of Mathematics, Queen's College.

GREGORY TYMBAS, Esq.

SENOR DON MANUEL PACHECO.

The Rev. H. H. HIGGINS exhibited one of the rarest of our Fungi, the *Batarrea phalloides*, found near Wallasey.

ISAAC BYERLEY, Esq., F.L.S., exhibited a Locust, captured last summer at Liscard; and a *Cidaris papillosa*, dredged off the N.W. coast of Ireland.

The Rev. J. ROBBERDS, B.A., referred to Sir John Herschel's successful translations into hexameter and pentameter verses, recently published.

Professor HAMILTON then read the first part of his paper, which will be found recorded in the business of the next ordinary meeting.

An EXTRAORDINARY MEETING was then held, to consider for the second time the motion adopted at the last meeting; which resolution was unanimously confirmed. (See page 46.)

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FOURTH ORDINARY MEETING.

ROYAL INSTITUTION, 30th November, 1857.

THOMAS INMAN, ESQ., M.D., PRESIDENT, in the Chair.

The following were elected Ordinary Members:—

ROBERT HENRY HALL, Esq.

WILLIAM HENRY GRIMMER, Esq.

The Resignations of Messrs. George Holt, jun., H. V. Rudd, and the Rev. P. Haines, Hoylake, were accepted.

Dr. RETSLAG took exception to the title of his paper as referred to in the last vol. of the Society's "Proceedings," taken from official documents; and to the brief report, which, he thought, did not correctly signify the nature of the communication.*

Professor T. C. ARCHER exhibited one of Messrs. Wessel and Kukla's patent gas stoves, the construction of which is exceedingly simple, and its merits considerable.†

* Dr. Retslag subsequently supplied the Secretary with a copy of his letter in the *Liverpool Albion*, dated May 6th, 1857, from which it appeared that the correct title of this paper was, "On the political philosophers of the 16th and 17th centuries;" and not, as reported, "On the political philosophy of the philosophers of the 16th and 17th centuries." The paper in question was a portion of "an introduction to an essay" upon that subject, in which the author seeks "to trace the gradual change in the public mind of Europe, and the effect of this change upon arts, sciences, and politics, particularly since the beginning of the 14th century, by preparation of the more materialistic views of modern times, in which nature and things material are no longer regarded as opposed and hostile to Spirit and God, but are his incarnation and one of his principal revelations." The Society is not responsible for, nor identified with, the individual sentiments of members which appear in print.—EDITOR.

† The Secretary has tested one of these little stoves by using it exclusively since Christmas last in his study, a room 18 by 15 feet, and 12 feet high, containing 3240 cubic feet of air, and freely ventilated by chimney, window, and two doors, one opening into the hall, and the other into a large passage leading to the garden. The means have also been present, through a large aquarium, of keeping the apartment from becoming unduly dry. During these months he has found no inconvenience from the stove, and much to commend in it. The atmosphere has never been unpleasant, has been comfortably heated by an expenditure of gas equal to three jets

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He also exhibited a number of models of Tropical fruits, presented to the Museum of Applied Science by Mr. Dadabhoi Naoroji; and submitted two white Annelides *(gen. Borlaria)*, found in one of the graving docks.

Mr. ALFRED HIGGINSON exhibited a piece of charred wood taken from the interior of the cover of a house boiler. An interesting discussion arose out of this on the chemical changes effected in vegetable materials by long exposure to steam, and on spontaneous combustion.

Dr. INMAN opened a case of preserved milk, forwarded by J. B. Lloyd, Esq., in whose possession it had been for three years. The process of preservation was that after the Abbé Moigno's, but it had entirely failed, the contents being decomposed.

The paper of the evening was then read.

ON THE COMPOSITION OF ROTATORY MOTION.

BY GEORGE HAMILTON, F.R.A.S., F.C.S.,
PROFESSOR OF CHEMISTRY, QUEEN'S COLLEGE.

I. PRINCIPLE OF COMPOUND ROTATIONS.

IF a body situated at A (Fig 1) on a plain surface receives an impulse in the direction AB, sufficient to con-

(not burning always), and perfectly fit for respiration. In a single hour he has been able to raise the temperature in January to 56° F., and he has generally sustained it at that heat, though he has had it in that month as high as 67° in all parts of the room. One of its greatest advantages has been the entire absence of trouble attending its use, the power of regulating the temperature by turning off the gas at pleasure, and of lighting it during the night when the room might require to be heated. The facility with which this gas stove can be fitted up will render it a most important furnishing to the bath-room, as well as to small chambers where fires cannot be conveniently used: and it is not unworthy of remark, that by a simple contrivance it may be used for laboratory purposes, a flask of water being speedily boiled over it, and evaporation as steadily conducted as may be desired. The discussion which has taken place on the advantages and possible disadvantages of Wessel and Kukla's stove justify these remarks upon its merits.—EDITOR.

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vey it to B in a certain unit of time, the body will move over the line AB with a uniform velocity, and arrive at B at the end of the given time. If it receives an impulse in the direction of AC, of such an intensity as would convey it to C in the same unit of time, at the end of the time the body will be at C, having moved uniformly over the line AC. If both forces, at the same instant, act on the body at A, it will move uniformly over the line AD, the diagonal of the parallelogram of which AB, AC, are adjacent sides, and arrive at the point D at the end of the given time.

Instead of considering A as a moveable body on a plane, let it be a fixed point on the surface of a sphere, the sphere being free to turn in any direction whatever.

The force applied at A (Fig. 2) in the direction of a tangent to the arc AC, will cause the point A to move uniformly through the arc AC. The force applied at A, in the direction of a tangent to AB, will cause the point A to move uniformly through the arc AB. If both forces be applied at the same instant, the point A will move neither over AC nor AB, but over some arc AD intermediate between the two; and if the time be indefinitely small, the arc AD will be the diagonal of an indefinitely small parallelogram constructed on the same principle as that which applies to compound rectilinear motions.

In order to pass from the consideration of the motions of a point on the surface of a sphere, to the consideration of the axes on which the sphere would turn in obedience to the impressed forces, let AB (Fig. 3) be the axis on which a sphere revolves with a velocity represented by the magnitude of the line AB, and let a force be applied to turn the sphere about the axis AC with a velocity represented by the magnitude of AC; then it may be demonstrated that the sphere will revolve about the axis AD,

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which lies in the plane BAC, with a velocity represented by the magnitude of AD, AD being the diagonal of the parallelogram ABDC, of which AB and AC are adjacent sides.

For this purpose assume any point on the surface of the sphere, let the projection of this point on the plane BAC be *a*, situated between AB and AC; then *ab*, perpendicular to AB, is the projection of the arc described by the assumed point, in a given time, about the axis AB; and similarly *ac* is the projection of the arc described by the same point, in the same time, about the axis AC, and if the time be indefinitely small, the diagonal *ad* of the parallelogram *abdc* will represent the direction and magnitude of the resulting motion, when both the component forces are impressed at the same instant of time.

But since *ab* is perpendicular to AB, and *ac* to AC, the angle *bac* is equal to BAC, and the sides about these equal angles are proportional, for they are proportional to the velocities, therefore the parallelogram ABDC is similar to the parallelogram *abdc*. It may be shewn that *ad* is perpendicular to AD, therfore AD is the new axis. Instead, therefore, of taking the parallelogram *abdc*, which refers to the motion of a point on the surface of a sphere, we may take the parallelogram ABDC, which refers to the axes on which the sphere turns. Thus it appears that if the adjacent sides of a parallelogram represent respectively the axes on which a sphere turns in obedience to two given forces, and also represent the velocities which the forces impart, the diagonal represents the direction of the resultant axis, and its magnitude represents the resultant velocity.

From the trigonometrical relations of the sides and angles of the figure, it is easy to deduce the most important propositions of the doctrine of compound rotatory motion. Thus:—

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$$AC : CD = \sin ADC : \sin DAC$$
$$\text{or } AC : AB = \sin BAD : \sin DAC$$
$$\text{or } v' : v = \sin BAD : \sin DAC$$

because AB and AC represent the velocities v and v'.

Thus the component velocities are to each other reciprocally as the parts into which the whole angle, between the component axes, is divided by the new axis of rotation.

$$\text{Again } AC : AD = \sin ADC : \sin ACD$$
$$= \sin BAD : \sin ABD$$
$$\text{or } v' : v'' = \sin BAD : \sin BAC.$$

Let ALBK (Figs. 4 and 5) be a sphere rotating about the axis KL, in the direction HAFB, and let an impulse be applied at A, in the direction AR, tending to make the sphere rotate about the axis HF.

If the point at A, at the instant of impact, could be carried to B in a time *infinitely* short, the impulse at A would then be equivalent to two equal forces acting on the lever AB at equal distances from the fulcrum C, and in directions AR, BR″, parallel to each other, the line AB therefore would remain at rest. But since the sphere cannot rotate with a velocity *infinitely* great, AB (Fig. 4) tends to assume the position *a b immediately* after impact, and the point A *begins* to move in the diagonal of an indefinitely small parallelogram (Fig. 5), in which

Ad : Aa = velocity about KL : velocity about HF.

The axis AB, therefore (Fig. 4), has *not* remained at rest, but has moved through an indefinitely small angle, ACa. The maximum effect of disturbance on the line AB is produced when the particle struck is at A, acting in the direction AR. When the particle which receives the impulse at A arrives at F by the rotation of the sphere, it tends to move in the direction FR′ parallel to AR; here it has no effect on the position of the axis AB, but it tends to turn the whole sphere about that axis in

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the direction of the arrow M. The *moment* of this force has its minimum effect when acting at F in the direction FR′. At any other point, *d* or *d′*, the force is as *gd′* or *g′d′*, that is as the sine of Ad or Bd′, the polar distance of the point.

When the particle which receives the impulse at A arrives at B, it tends to move in the direction BR″ parallel to AR, and therefore tends to restore the axis, from its position *ab*, to its previous position AB.

Now if the particle when at F, tending to move in the direction FR′ by the impulse received at A, could move to H through the semicircle FBH in a time *infinitely* short, it would be equivalent to two equal forces at F and H, at equal distances from the fulcrum C of the lever FH, acting in lines FR′, HR‴, parallel to each other, and FH would therefore remain at rest, that is, the sphere would not rotate about the axis AB in the direction of the arrow M. But the particle cannot be conveyed from F to H in a time *infinitely* short; therefore the particle, in moving through the whole arc AFB, tends to make the sphere rotate about the axis AB in the direction of the arrow M.

Again, the impulse applied at A, in the direction AR, causes B to move in the direction BQ; when the particle at B is carried by the rotation of the sphere to H, it tends to move in the direction HQ′, and therefore tends to turn the sphere about the axis AB in the direction of the arrow M′, the whole sphere will therefore revolve about the axis AB in the direction of the arrows MM′.

Now, if instead of a single impulse acting at A, there is a *constant* force acting in a fixed direction AR, the rotation of the sphere about AB will continue until the axis CL is brought to coincide with CH, the sphere will then revolve about *one* axis HF. The force at A acting in the direction AR, which produced its minimum effect on the line of particles AB, when the sphere revolved about the

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axis KL, will now produce its maximum effect upon the same line of particles when the sphere revolves about the axis HF, and the sphere will revolve with an accelerating velocity.

From this reasoning it seems to follow, that if any sphere ADBC, Fig. 6, revolving about an axis AB, with a *velocity however great*, is acted on by a constant force, *however small*, tending to make it revolve about the axis CD, the sphere will revolve about a third axis perpendicular to both AB and CD, until AB is brought to coincide with CD.

If the force at A (Fig. 4), instead of acting in a fixed direction in space AR, acts always in a line at right angles to the plane of the lamina AFBH, the sphere will continue revolving about the axis AB in the direction of the arrows MM'. The oscillatory motion of the axis AB, compounded with this rotation, will cause the pole to describe an undulating line about the circumference of a small circle, whose diameter will depend on the intensity of the disturbing force applied at A.

II. APPLICATION OF THE PRINCIPLE TO PLANETARY MOTIONS.

Let S (Fig. 7) be the sun, and AMBM' the earth. Let the whole sphere AMBM' be divided into laminæ AB, &c., whose planes are parallel to each other, and at right angles to SC. If the whole of the matter of each lamina be collected into its centre of gravity, the equilibrium of the system will remain unchanged; the sphere will thus become a line of material particles M' M, whose centre is C.

Now, because the particle at M' is nearer to S. it will be more strongly attracted than an equal particle at M. The same may be said of every pair of particles equidistant from C, hence the centre of gravity G, of the whole line M'M, will always be nearer than its centre C to the sun S.

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The point C is the centre of gravity of the line M′M when the attraction of the sun is disregarded; but G is the centre of gravity of the same line M′M when the attraction of the sun is considered.

Let the extremity M of the line M′M receive an impulse in the direction MN, at right angles to SM. In obedience to this impulse M will *begin* to move about the centre of gravity G. Let the point M move through an indefinitely small arc M*m*. Then G*m* is not greater than GM. But SG, G*m*, are together greater than S*m*; therefore SM is greater than S*m*; therefore the particle at M has approached S in moving from M to *m*.

But if the line M′M move in an orbit about the centre S, the centrifugal force generated by the orbitual motion acting on the particle at M, will tend to make it move in the arc MN, and therefore resist the approach of the particle to S, and therefore resist the motion of the line M′M about the centre of gravity G. The same may be said of every particle between G and M; but the centre of gravity C of the whole line M′M always lies between G and M; therefore the orbitual motion of the line M′M about the centre S, resists the rotatory motion of the same line M′M about the centre of gravity G. But the line M′M is made up of the centres of gravity of the laminæ which compose the whole sphere; hence the rotation of the sphere about the centre of gravity G is resisted by the orbitual motion of the sphere about the centre S.

If it be objected that M′M will not move about the centre G, but about the centre C, then let the circle GKL (Fig. 8), be the locus of the point G; and because CM is equal to C*m*, therefore SM is equal to SC, C*m*. But SC, C*m* are greater than S*m*: the rest of the argument follows as before.

If a sphere (Fig. 9), having no independent axial rotation, moves in an orbit about a centre of attraction S,

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having the same side CBD always turned towards S, it is obvious that it turns once round an axis CD in going once round its orbit, and that CD is perpendicular to the plane of its orbit. But if the sphere also rotates on an axis AB inclined to the plane of the orbit, whilst any force, however small, tends to make it rotate about the axis CD, then AB will gradually approximate to CD, and finally coincide with it.

III. PROGRESSIVE CHANGE IN THE FORM OF THE EARTH.

If a spheroid of equilibrium, NQSE (Fig. 10), contract uniformly in lines perpendicular to its surface, a new spheroid, N′Q′S′E′, is produced of a greater degree of excentricity. For if CQ be the semi-transverse, and CN the semi-conjugate axis of the elliptical section NQSE of the spheroid, and if from these there be taken the equals NN′ and QQ′, the remainder CQ′ has to the remainder CN′ a greater ratio than CQ to CN, therefore the excentricity of the spheroid is increased.

But if the spheroid, rotating on an axis, contract in size, its velocity of rotation will be increased: this increase of velocity would tend to increase its excentricity. Now, it is *barely* possible that the increased excentricity due to the contraction, should be *precisely* the same as the increase of excentricity due to the increased speed of rotation; in that case the spheroid would still be one of equilibrium, notwithstanding the alteration of its form.

But if the increase of excentricity arising from contraction, is greater than that arising from the increased speed, the effect will be an accumulation of matter in the equatorial region, an increase of pressure on the internal mass, and a tendency to subsidence into the northern and southern hemispheres. A change of form is then necessary to restore equilibrium. This may not take place uniformly *per gradum*; for if there be a resistance from a

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rigid external crust, the force must accumulate until it exceeds the resistance, and thus frequent adjustments, *per saltem*, may ensue. It is probable, therefore, that the earth's form is undergoing a slow progressive change; and if so, it must be taken into account by those who venture to speculate on the causes of earthquakes, volcanic eruptions, and the upheaval of mountains.

IV. DESCRIPTION OF THE GYROSCOPE.

1. When the disc is in rapid motion it resists any force which tends to alter its plane of rotation, because the point at which the force is applied is conveyed to the point diametrically opposite, before it has time to move in any perceptible degree in the direction of the impressed force.

2. When a force is applied to turn the disc about a vertical axis, whilst it is turning on a horizontal axis, the plane of rotation is changed. Assume a point in the upper edge of the disc. It tends to move in the direction of a tangent, and when the disc is moved about a vertical axis, the point assumed still tends, by its inertia, to continue its motion in the same direction as before, that is, *now* obliquely to the disc, and therefore tending to alter its plane of rotation.

3. When a weight is suspended to the extremity of the horizontal axis on which the disc turns, the plane of the disc is not sensibly drawn out of the perpendicular, but a motion is produced about the vertical axis. Assume a point in the upper edge of the disc. Place a thread on it by means of a piece of sealing wax, leaving the two ends free from the point of attachment. Pull one thread in the direction of the tangent, thus producing a rotation of the disc: pull the other at right angles to the plane of the disc, thus producing the same effect as the weight. This force cannot perceptibly alter the plane of rotation,

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(1) the only effect it can produce is a horizontal motion about the vertical axis.

4. When one end of the axis of the revolving disc is supported by a string, and the other end left without a support, the disc does not fall, but revolves horizontally round the string as a centre. The action of gravity tends to turn the disc round a horizontal axis, and we have seen (1) that the rotating disc resists all forces which tend to alter its plane of rotation. When the speed is sufficiently great it resists the force of gravity, therefore it cannot fall; but it moves horizontally round the string, because the action of gravity tends to turn the disc round a horizontal axis, as in Exp. 3, and its motion in a horizontal direction round the string is owing to the same cause.

5. When the disc is inclined to one side, a motion frequently ensues round a vertical axis. This is caused by the friction of the pivots on the outer ring. When the axis of the disc is perfectly horizontal, the friction has no tendency to produce this motion. When the motion commences, the inclination of the disc continually increases, because the rotation of the disc tends to carry any point of the circumference in the direction of a tangent, and the motion round a vertical axis turns the plane of the disc out of that direction, the inertia of the point assumed acts as described in (2). This increases the inclination, the friction now acts at a greater advantage, thus the motion about the vertical axis is accelerated, which again increases the inclination of the disc, bringing it still nearer the horizontal position. At length this position is attained, and now the whole force of friction is employed in producing a motion round the vertical axis.

6. When the gyroscope is fastened by a screw or clamp in such a manner as to keep the rotating disc always vertical, and placed in the centre of a turning table, it maintains its plane of rotation unchanged, notwithstanding

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the motion of the table. When placed near the edge of the table, so as to be conveyed through the circumference of a circle, the plane of the disc is always parallel to its first position, for the reason stated in (1). If it were placed in the centre of a circle at the pole of the earth, the plane of the disc would appear to move round a vertical axis in twenty-four hours. This property of maintaining the plane of rotation unchanged has been proposed as a means of proving experimentally the rotation of the earth on its axis. If the instrument be placed at any point between the pole and the equator, the time of an apparent revolution round a vertical axis will be more than twenty-four hours, and the time is greater the nearer it approaches to the equator. When at the equator it will not move round the vertical axis at all.

In order to explain this satisfactorily, it is necessary to state what is meant by saying that the revolving disc maintains its plane of rotation unchanged. The plane of rotation is not absolutely unchangeable, since it always coincides with a great circle of the earth (when clamped as described) passing through the station, and therefore it partakes of the diurnal motion of the earth, except when situated at one of the poles.

Let A (Fig. 11) be the station, and let it be carried through the small arc AB by the diurnal motion of the earth, the plane of rotation of the disc at the point B, is not BY, which is a small circle, but BDV, a great circle intersecting the great circle APV in two points VV′, diametrically apposite.

Since APV = 90°, and AP is the distance of A from the pole P, therefore PV = latitude of A. And when the arc AB is very small, BDV = APV = 90°. Hence, in the spherical triangle VPB, (Fig. 4.)

$$\text{Sin VPB} : \sin \text{PBV} = \sin \text{VB} : \sin \text{VP}.$$

$$\text{or Sin } \varphi : \sin \theta = \text{R} : \sin \text{lat.}$$

$$\text{or Arc } ab : \text{arc } cd = 1 : \sin \text{lat.}$$

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Now, *ab* is the arc of a circle which the plane of rotation of the disc would appear to describe if placed at the pole, and *cd* is the arc which it would appear to describe in the same time in the latitude AB; and since the arcs are to each other inversely as the times of description of the whole circumference, it follows that the time of describing the whole circumference in latitude A : time of describing the whole circumference at P $= ab : cd.$

$= 1 :$ sin lat. A.

$$\text{Time in lat A} = \frac{\text{Time at P}}{\text{sin lat.}} = \frac{24 \text{ hours}}{\text{sin lat.}}$$

$$\text{and Time at Equator} = \frac{24 \text{ hours}}{0} = \text{Infinity.}$$

As I am by no means certain of the correctness of some of the conclusions at which I have arrived, I submit them to the Society with considerable diffidence and distrust, as subjects for discussion rather than as demonstrated truths. They seem to me, at present, to follow legitimately from the doctrine of compound rotatory motion. If there is any error in my reasoning, I am not able to discover it; and I shall feel greatly obliged to any one who will indicate where it is, as I shall thus be enabled to approach nearer the truth than the point at which I have arrived by my own independent investigations.

Professor Elliot thanked Professor Hamilton for the more than ample justice he had dealt out to him in noticing his instruments. He begged leave to make some additional statements regarding his own researches on the subject, as well as those of others. Professor Hamilton had correctly described his (Professor Elliot's) instruments for illustrating, both in regard to fact and principle, the precession of the equinoxes, the nutation of

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FIG. 10

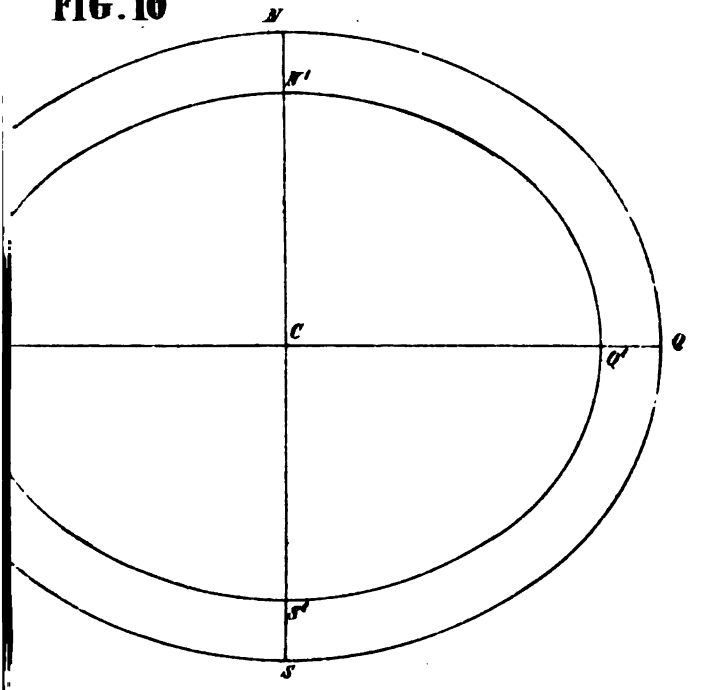
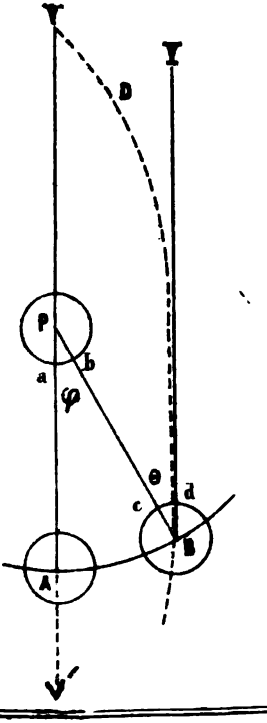


FIG. 11



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the earth's axis, the retrogradation of the moon's nodes, the equilibrium of Saturn's rings, and the peculiar effect of a magnet upon an iron disc in rotation. He had been led to the construction of the first of these instruments so long ago as 1835, from the difficulty he experienced while teaching astronomy, in explaining the subject of precession by mere verbal description. He conceived that the motions of the common spinning-top might be converted into an exact imitation of those of the earth, by altering the position of the centre of gravity in reference to the point of support. In the conception of such an instrument, he was not aware at the time that he had been anticipated by others; but he now found that the records of the Royal Astronomical Society contained a short and obscure notice of a similar instrument, which had previously been constructed by Mr. Atkinson. M. Bohnenberger's gyroscope had also been previously known on the Continent, and partially in this country, which, among other purposes, exhibited correctly the precession of the equinoxes; and Mr. Higginson, now present, had, it appeared, constructed an instrument of the same kind. The effect of a magnet on a rotating iron disc had been shewn to him (Professor Elliot) by a friend, but almost accidentally, and without reference to its theory or astronomical application. Its use for that purpose was to exhibit the effect of one planet in disturbing the plane of another planet's orbit, in eight different positions of the disturbing body (as described in Newton's Principia), in producing a forward or a backward movement of the nodes, or an increase or diminution of the obliquity of the plane of its orbit to the ecliptic. Professor Elliot stated that, although his experiment with the iron ring and magnet was admitted to be an exact imitation of the peculiar motion of Saturn's rings, yet the coincidence of the two in regard to principle had been disputed

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by some of our best mathematicians. The objection advanced to it by Professor Thomson, of Glasgow, that the one was, to a certain extent, a constrained, and the other a perfectly free motion, was certainly a valid objection; but there were some difficulties attending the subject which required to be removed by further experiment. He (Professor Elliot) had shown the greater part of these experiments to the Liverpool Polytechnic Society in the year 1839. Since that time the subject of rotatory motion had become a fashionable study among mathematicians, having been taken up successively by Professors Magnus, Wheatsone, Powell, Foucault, Smyth, and Maxwell. Foucault's experiment for shewing the stability (perfect or partial) of a rotating disc during the earth's rotation was not new *in theory*, as it had been described more than twenty years before by Mr. Sang; nor was it in his (Professor Elliot's) opinion *practically* successful in shewing the earth's rotation, since its success depended altogether upon the adjustment of the apparatus, and the only mode, he believed, of making that very delicate adjustment, was by trying if it produced the very motion it was intended to demonstrate. It could be made to shew the rotation of the earth, or not to shew it, just as it was balanced. Professor Smyth's apparatus he had previously described. Professor Maxwell, of Aberdeen, was the last who had produced any thing new on the subject of rotatory motion, and in a set of beautiful experiments, and some refined calculations, he had advanced further into the subject than any of his predecessors. Professor Maxwell's principal object was to throw light on the theory of Saturn's ring. In his essay, for which he lately had the high honour of gaining the Adams' Prize offered by St. John's College, Cambridge for the best dissertation on that subject, Professor Maxwell objected to the applicability of his

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(Professor Elliot's) experiment on the iron ring to that of Saturn, but agreed with him in maintaining that Laplace's hypothesis of a load on the ring was untenable. Professor Elliot briefly described two other experiments which he had himself made in regard to rotation. One of these consisted in magnetizing the axis of a light rotating disc, carefully depriving the disc of all precessional movement, inclining its axis a little from the vertical line, placing over its centre an electro-magnet, and then giving to the disc a rapid rotation on its axis. The axis remained at rest in its oblique position till an electric current was passed along the wire of the electro-magnet; as soon as that was done the axis of the disc began to revolve round the magnet. When the current was transmitted in the opposite direction, the direction of revolution immediately changed, producing a singularly close resemblance to that mysterious phenomenon, electro-magnetic rotation. The other experiment consisted in taking a very large cylindrical vessel of water, making a small orifice in the centre of the base, with a straight brass pipe extending a few inches downward, the outer end of the pipe being closed with a plug, and the inner end being made perfectly smooth. The vessel was filled with water, and as soon as that had attained perfect repose the plug was withdrawn. This being done, as the level of the water sank, it gradually acquired a rotatory movement, at first very slow, but becoming more rapid as the evacuation proceeded, and always in the direction of the earth's rotation, provided that perfect stillness of the fluid had been secured. The *rationale* of the process was this: That the vessel of water participated in the earth's diurnal rotation; its own motions consisting of a revolution round the earth's axis and a slow rotation on its own axis, that the portions near the circumference had a more rapid motion in rota-

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tion than those near the centre. In approaching the centre they retained their actual velocity, and consequently increased in angular velocity, and, in escaping at the central orifice, produced a vortex in the direction of the earth's rotation, affording another experimental proof that such rotation existed.

FIFTH ORDINARY MEETING.

ROYAL INSTITUTION, 14th December, 1857.

The REV. H. H. HIGGINS, M.A., V.P., in the Chair.

ROBERT TOPHAM STEELE, Esq. was elected an Ordinary Member.

The resignation of Mr. C. Millward was accepted.

The death of Mr. S. T. Winstanley was communicated.

Mr. A. HIGGINSON submitted portions of the skeleton of a shark, and explained its anatomy.

Mr. T. C. ARCHER exhibited a series of English lichens, prepared by Dr. W. L. Lindsay, together with fabrics dyed by them.

Mr. WHITEHEAD exhibited portions of the wooden keel of a vessel extensively destroyed by the *teredo navalis*, also specimens of the worm.

The paper of the evening was then read "ON THE SMELTING AND ASSAYING OF TIN ORES, &c.," by NEWTON SAMUELSON, Esq., F.C.S.

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SIXTH ORDINARY MEETING.

ROYAL INSTITUTION, 11th January, 1858.

The REV. H. H. HIGGINS, M.A., V.P., in the Chair.

CHARLES BOTTERILL, Esq., was elected an Ordinary Member.

A paper was read "ON THE PRESERVATION OF FRESH MEATS, &c., IN METALLIC CASES," by CHRISTOPHER BELL, Esq.

The author entered into the details of the various processes in use, the particulars of which he had ascertained, and illustrated the same by specimens of home and foreign product. In presence of the members, many cases were opened, some of which had been sealed for ten and fourteen years. Mr. Goldner's stood this severe test, as well as those prepared by the Messrs. McCall and Co., his successors in the business. Not one of the canisters opened was unsound, but the home was better than the foreign. The process of preservation was the coagulation of the albumen and expulsion of oxygen, effected by simple means effectually applied.

The following paper was then read:—

NOTES ON SOME OF THE PRINCIPAL STATIONS FOR BOTANIZING IN THE NEIGHBOURHOOD OF LIVERPOOL.

BY THE REV. H. H. HIGGINS, M.A., SEN. V.P.

THE vicinity of Liverpool has for many years been diligently examined by botanists in search of phanerogamic plants, and their labours have been rewarded by the discovery of a series probably as extensive as any collected in Britain within a district of similar extent.

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The following Table, shewing the number of species of flowering plants in some of the local Floras of Britain, is extracted from "Remarks on the Geographical Distribution of British Plants," by Hewett Cottrell Watson.

MARITIME.	No.	INLAND.	No.
Devon	774	Tunbridge	717
Yarmouth	724	Oxford	727
Anglesea	764	Bedford	717
Berwick	707	Cambridge	847
Edinburgh	774	Bath	632
Glasgow	629	Lanark	604
Mean	728	Mean	707

This Table was published in 1835, at which time the author considered 1400 species to be the extreme limit of the British Flora. Some of the Floras were issued at a much earlier date, as that of Bedford, by Dr. Abbot, in 1798. The "Flora Edinensis," published in 1834, contains 750 species.

The following Floras are more recent:

Yorkshire	956	dated	1854
Shropshire	893	„	1841
Oxfordshire	860	„	1833
Manchester	713	„	1849
Liverpool	835	„	1851–5

My attention has been chiefly given to the Cryptogamia, but in the course of various excursions in the vicinity of Liverpool during four seasons, I have met with more than 600 species of flowering plants.

That so many plants are found in a district somewhat unpromising in its first appearance, may be accounted for by the fact that, within a circuit of ten or twelve miles round Liverpool, a botanist may make at least five or six excursions to localities each one differing widely from the rest in its floral character.

Woods and Woodlands.—First in order we may notice

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the woodlands of the Wirral, amongst which Gilbrook once stood pre-eminent, but its timbered honours are now reduced to a few thinly scattered trees. Noble banks of wood, however, remain at Bromborough and Eastham, rich in *Labiatæ*. The borders of the stream from Patrick Wood upwards afford *Musci* and *Hepaticæ* rarely to be obtained elsewhere; and the winding valley is sheltered all the way by steep and lofty banks, where may be found sunny nooks in which Spring wakes the flowers and the birds weeks before Winter has ceased to reign on the northern shores of the Mersey. Turning westward, large plantations of fir crown the Stourton promontory, quite to its extremity at Bidston. *Boleti* abound in these, and near Flaybrick the plantations afford many interesting species of *Cladonia*.

Very similar to these, botanically, are the fir plantations skirting Simon's Wood, Rainford, Windle, Sutton, and Bold Mosses. In the latter only I have seen in profusion the lovely cyclamen-shaped flowers of the *Cranberry*.

The woodland walks in the Lancashire portion of our district are very unlike those on the opposite side of the river; the surface of the ground is flat, and even in summer there is a formal cheerless character about the woods. This is especially the case at Ince Blundell, where the woods are enclosed by large moats, in which lie buried the leaves of many seasons. Fine avenues of beech do indeed redeem the character of the place for beauty, and though few flowers of much botanical interest are to be found, the remark of Fries on the peculiar productiveness of beech woods in *Agarics*, may be verified there any time in Autumn.

The wood called the "Old Roughs" at Kirby, Acornfield Wood, and the woods at Croxteth, are all admirable localities for Fungi. *Broad-leaved Helleborine* and *Ramsons*

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flourish at Croxteth, but *Wood Crowfoot* has become very scarce. Hale and Speke woods are celebrated in the Flora as containing several botanical rarities, and though some of them have been lately sought for in vain, I do not therefore doubt that a further search might be successful.

It is no slight amount of investigation that is required to ascertain all the species, even of flowering plants, that belong to any given locality; much more when the cryptogamia are included. In confirmation of this, I may mention a little unlikely-looking wood, called Hangsdale's Wood, at Rainhill. This wood being near my house, can be examined by me much oftener than distant localities: it has produced a surprising list of Fungi, and of flowering plants, *Woodruff*, *Cow-wheat*, *Sanicle*, and *Saw-wort*, besides some good carices and grasses.

The remarks which I made upon the formal and uninteresting character of our neighbouring woods, do not apply to Knowsley Park, where there is some fine forest scenery. A large portion of the domain is left as much as possible in its natural condition: in some spots the oaks are of great age and size; and when the mellow tints of autumn are reflected from the Bracken, and gleams of the retiring sun fall upon the grey and knotted trunks of the venerable trees, under which are browsing herds of red and fallow deer, the scene is one for any lover of nature to rejoice in, but for a Gilpin only to describe. The species of flowering plants in the park are not very numerous; but it is the only locality that I know of for *Various-leaved Pond-weed* and the *Lesser Skullcap*.

Before leaving this part of the subject, I may notice a remarkable contrast between the woods of the Wirral and those on this side of the Mersey, in respect of Lichens, and Mosses that grow upon trees. In Cheshire,

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almost every plantation contains trees which may be examined with success; in mosses for *Orthotricum*, *Hypnum*, *Omalia*, &c.; in lichens for *Opegrapha*, *Calicium*, &c.: even single trees by the road side are worth attention, but on this side I do not know a single locality where there are trees producing any but the most ordinary species.

Lanes.—From the woods we pass on to notice a few of the more interesting lanes belonging to the district, which, although they cannot be said to have distinct botanical features of their own, but partake of those which are common to the country through which they pass, are yet so pleasant and so useful, that it is probable few botanists have rambled much without having their often frequented and favourite lanes.

A short but promising lane leads from a point near Woolfall Heath to the Little Wood, Croxteth. In early spring the banks of this lane are covered with the *Cuckow-pint*, fruiting finely, the spadix varying from lemon colour to the deepest crimson.

An admirable lane leads from Formby Station to the Church on the sands, where it turns to the left. *Hypnum purum* and *Climacium dendroides* are found here in fruit.

A lane leads from the toll-bar on the hill upon the road to Upton, and passing Noctorum sharply descends the hill, eventually joining the Woodchurch road. The whole of this lane is excellent; where it crosses Oxton Heath, *Marsh Gentian* and the *dotted-fruited Carex* are found; as it approaches the valley there are walls which seem very ancient, and are covered with *Pennywort*, whilst the banks a little further on afford the *Black-stalked Spleenwort* in profusion.

A great number of other lanes are connected with pleasant botanical associations, but I will mention only one, which leads from Halewood, by the Old Hut, to

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Heath-farm. This lane, with the adjacent thicket, affords good botanizing in spring, summer, or autumn; and should the plants disappoint the rambler, he will find the picturesque Old Hut, an ancient forester's tower and dwelling, with quaintly timbered walls and broad overhanging eaves, well worth a visit.

Peat Mosses.—These Mosses occupy a large tract of country to the north of Liverpool, extending from the flats on the west of Kirkby far to the north-east, and, mixed with patches of cultivated ground, reaching to Upholland, or even almost to Wigan. The principal of them are known by the names of Simon's-wood Moss, Rainford Moss, Windle Moss, &c.

The beacon hill at Billinge stands as a bold headland, jutting out into this vast plain; similarly the Bidston hill overlooks, and in fact divides, the Leasowe level.

A tract of undulating or broken ground, part of which is the St. Helens coal field, separates the Mosses we have named from the Sutton and Bold Mosses; and these again have a similar boundary at Newton, intervening between them and the very extensive moss district, a part of which is known as Chat Moss.

I do not mention all these as belonging to our district, but merely to point out how very extensive is the chain of turf-bogs to which our Liverpool mosses belong.

The plants most characteristic of the pure peat moss in this neighbourhood seem to be the Andromeda, Crowberry, Sweet Gale, and the Red-necked Fork-moss.

Heaths.—The term Heath is often used synonymously with Peat-moss. It may, however, perhaps more properly indicate a peaty soil in a more exposed and elevated position, such as we have on the Bidston, Grange, and Heswall hills, where the rock generally approaches the surface. The very pretty white and pink English Stonecrop abounds on the heaths near the Dee.

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Bidston heath is by far our best locality for Lichens and Jungermanniæ; in fact, every part of the hill deserves and will repay a careful examination; and when the botanist is wearied with his labour, he may delight himself with the prospect before him: a prospect which, it has often pleased me to notice, numbers of our Liverpool operatives seem thoroughly to appreciate.

Flats and Marshes.—From the neighbourhood of Ormskirk to Formby extends a level district, part of which is peaty, but more generally the soil is much mixed with sand. Nearly all the tract is cultivated, and the land is almost on a level with the water in the ditches by which it is intersected. The Leasowe level has many features in correspondence with this district, but it has much more recently been overflowed by the sea.

The plants upon these flats are very numerous. The Buckbean, Water-violet, Frog-bit, Greater Spear-wort, Meadow-rue, and the little marsh Pimpernel, all of which are found upon the northern flats, especially near Down-Holland, are amongst the prettiest of our British wild flowers. The plants upon the Leasowe level are less conspicuous, but not less curious. Upon Bidston marsh, however, grows in abundance the flowering rush, equal in beauty to any. This marsh, which has been one of our richest botanizing grounds, is fast disappearing.

Salt-marshes.—We have three distinct localities which may be noticed under this head: a mile or two of the shore of the Mersey, near Ditton; the entrance to Bromborough Pool; and the entrance to Wallasey Pool from Seacombe upwards. These places have a Flora of their own, entirely distinct from that of the surrounding neighbourhood. The *Chenopodiaceæ*, that most puzzling tribe, abound, and a host of plants of many genera, rejoicing in the trivial name of *maritima*. The spreading Sea Lavender grows plentifully on the side of Wallasey

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Pool up to and above Poolton bridge; this plant thrives in gardens, and is well worth transplantation. Ruppia grows in the salt pools in the same locality, and a large plot of ground near the Seacombe slip, apparently intended for a dock, is covered by a most curious vegetation, including the jointed Glass-wort.

The Sand-hills.—It would be vain to attempt a notice of the multitude of interesting plants found upon the Sand-hills from the Dee to Southport, except in a paper especially devoted to the subject. These wild mounds have many features entirely their own: we gain a sandy peak, and what a wide-spread scene of busy life is before us. Look at the opposite shore, where the houses rise tier above tier, like the heads of a crowd at a spectacle—all are jealous to have a fair view of the rippling waves, and their own full share of the sweet sea breeze, and with good reason too; time there is often short and precious; many a father of a family finds in those dwellings a fortnight's solace after fifty weeks of toil. We may imagine he is looking with a telescope through that open window, whilst the mother is watching how the sea air restores the colour to some faded cheek; the little ones are away, we may see them just below, like dots at the edge of the waves, digging the sand with their tiny spades.

Those glorious ships, how proudly they enter port, and how hopefully they depart: and what a fleet of steamers, some so nigh we may hear the roar of their paddle-wheels; others far away, hidden by the waves, but we know where they are by their long dusky streamers; more than all we have before us the sea itself, the world's sea, that washes the shores of every land. How great and grand and good is the earth where God has placed man. But listen! there is music too, sweet music, high over head: if sound there be that can express an

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ecstacy of joy, it is that little warbler's note; bright sea, swift ships, busy shores, he sees it all, praises the Creator, and drops to the side of his mate. Not many steps and we are at the bottom of the hollow: how complete the change! we see in no direction further than a few yards; the outer world of life is as much excluded as if we were in the depths of the Sahara; yet within a sandy hollow is a world of life and beauty; mark how the drooping sea-reed draws about itself a magic circle in the sand; that falling stream of glittering atoms may give us a lesson in geology: bright *Cicindelidæ* are basking in the sun: everywhere appears wisdom and animation. Must we except those scattered snail shells that lie strewn upon the sand? Where all else is seen to have a purpose, they appear only the sport of the whirling breeze, symbols of whatever is worn out, cast off, empty and useless. Let us watch them for a moment: notice that golden-haired bee, *Osmia aurulenta*, hovering over them: she alights and disappears; she has entered a shell, and safely in its whorls has deposited her egg with a store of food for the larva, and on some future day from that bleached shell shall issue the winged insect that is to represent whatever of beauty and of excellency the creative thought bestowed upon its species.

Woods and heaths and lanes are happy places, but to me even they yield less interest than our wild tempest beaten sand hills.

Two localities upon the coast remain to be noticed, the first of which is the elevated and much broken ground between New Brighton and Wallasey, producing several rare flowering plants, and *Batarrea phalloides*, a fungus so rare that Mr. Berkeley informs me the only British specimen in his possession is the original one from which the plant was figured in "Sowerby's English Botany."

The shore of the Dee, including Hilbre Island, is also

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admirable botanizing ground. I have seldom seen a parterre in any garden more vividly coloured than the banks of the Dee below Parkgate, where the *Bloody Crane's-bill* and the *Yellow Horned Poppy* line the shore for nearly a mile with a glowing border of crimson and gold.

I have endeavoured to mention the principal fields of our district for botanical excursions. It must not, however, be supposed that all the plants in our local Flora are to be found in the course of a few visits to these likely localities. Some plants seem to disappear for several seasons in succession, and I have often returned from a vain search in a station of the highest character, and on my way home have found a long sought prize in a spot where it was little expected.

It may be interesting to compare the various proportions in which some of our more distinct botanical fields contribute to our local list of flowering plants. This can, of course, only be done approximately. Woods and woodlands afford 56 species; pastures and meadows 45; corn-fields 29; peaty soil, heaths, and bogs 40; purely aquatic localities 36; ditches, marshes, and wet places not distinctly peaty 123; walls, banks, hedges, road-sides, and waste places 254; sand-hills 69; the Dee shore 13; banks, rocks, and broken ground near the sea 38; salt-marshes 14; plants supposed to be not indigenous 62; plants that have been met with on only one occasion 28; species concerning the occurrence of which within the district there is doubt 28; making a total of 835 species out of 1561 flowering plants described by Hooker and Arnott in their British Flora of 1855.

Of Ferns and their allies our local list contains 32 species. The species in the British Flora are 60 in number.

The unwearied zeal with which Mr. F. P. Marrat has

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applied himself to investigate the mosses of the district, has enabled him to enrich our local Flora with a list of 200 species. 446 species are described in the "Bryologia Britannica," published by Mr. Wilson, in 1855.

I have not thought it desirable to particularise the stations for rare or curious plants, such information being more appropriately given in the local Flora by Dr. Dickenson, published in the "Proceedings" of this Society.

SEVENTH ORDINARY MEETING.

ROYAL INSTITUTION, 25th February, 1858.

The REV. H. H. HIGGINS, M.A., Sen. V.P., in the Chair.

Dr. THOMSON exhibited and explained Mr. Turner's ingenious apparatus for detecting burglars.

Mr. BYERLEY exhibited a piece of wood cut from timber floated ashore off New Brighton, completely covered with barnacles; also a piece bored by the *teredo navalis*, containing fine specimens of the worm.

The following paper was then read:—

ON THE MORAL DIGNITY OF THE SHAKSPERIAN DRAMA.

BY J. T. FOARD, ESQ.

THE contemplation of any of the vast and magnificent architectural monuments bequeathed to us by distant ages, appears naturally to provoke inquiry into the necessities and motives which gave them birth. In presence of the Pyramids, of the ruins of "the hundred-gated" Thebes,

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of the Temples of Nineveh, the mind, dispelling its instinctive and involuntary awe, recurs at once to their founders. To the men of whom these columns and fragments are but the "fossil remains." To seek the moral of the story these monuments enshrine. To ask if these beacons, which now hold lonely watch by the graves of a departed race, by their deserted hearths, by their silent homes, tell of a nobler race than our own; and enquire if they were of a loftier strain, of a more enduring courage, of a more self-sacrificing spirit than the men of to-day. For the human interest is still above all, and these bleaching skeletons and scattered bones of antique walls bear the burden of a song which can never grow old; which tells of hearts now cold, once full of passionate desires; of heads which have long ceased to throb, once not less ardent, restless than our own; or, it may be, of a people patient, pious, of a more practical faith and a more sublime ambition. The men who planted these breastworks against the tide of time, who framed these records to outlive their own brief day of sunshine and of shade, chose no mute means of appeal. The hand which framed column and lintel, key-stone and arch, stretched across the wide abyss of ages, of countries, and of climes, returns a warm and still vital pressure. Like the horn hung at the gate of enchanted castles in fairy tales, it is still potent to renew all grand and glorious memories, to wake the silence into busy life, to people the solitude with men, and, by the pomp and circumstance of antique life, kindle a new and not less generous emulation.

Who and what were these men? Under what creed, with what hope, by what inspiration built they so wisely and so well; not so much to endure, as to be worthy to endure; not so strong only, but so fitted to the mutations of fortune and of fate? Were their temples reared by many minds in unison? Whose

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motives lent an elevation to their labours, or borrowed grace from its achievements? or did purely artistic considerations, or a sublime purpose lend its lustre to crown the glory of their deeds? These are questions that most naturally occur in reference to the relic of an art of which the bond of sympathy has been torn away, founded by men between whom and ourselves there is a great gulf fixed—for they were not Christians. The same considerations occur to us more promptly, and influence us more powerfully, in connexion with the remains of mediæval or Christian art and architecture. The moral of design and spirit of construction of the churches and cathedrals of the middle ages has a nearer and dearer interest, and is a subject no less of pleasant than important inquiry and legitimate research.

Modern criticism pronouncing on this ecclesiastical architecture, assumes the existence of a moral grandeur and dignified purpose superior to the instincts of emulation, or even of those influences of artistic propriety which constrain an artist in the execution of his work. It declares that what was accomplished with the rude engineering appliances of a semi-barbarian age, proves that some special motive, more or less exalted, is needed above mere power or resource, to achieve lasting and unchallenged honour, and for the consecration of labour to immortality. That an earnest and zealous devotional spirit, was alike the necessity that originated these splendid edifices, and of their unapproachable excellence. It has proceeded further: it has declared that a certain superiority and grandeur of motive and design, are necessary to the supremacy of all that is to be eternal in duration or universal in acceptance; that singleness and purity of heart are demanded, to consecrate such efforts, and fit them with the moral dignity, essential to command unmixed and inevitable approval.

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If this is true, wholly or in part, of one branch or phase of art, it must be no less true of each and every aspect of the same subject; of art spoken or written, as of art carved in stone or framed in architecture; of art dramatic and epic, as of art picturesque and pictorial. Antique philosophy (no less than antique fable in the mythology) assigned to dramatic art, epic poetry, and sculpture a common origin; the same beneficient tutelary guardianship of Minerva, and by her impersonation, the same miraculous origin and maturity at birth. The perfection of the highest possibilities of literature in tragedy and epic poetry (as of sculpture and architecture), in the results of one master mind, substantiate the truth, shadowed by the fable, of the unity in nature and origin of all art. Modern philosophy, with a spirit which seeks differences with a view to classification, rather than to discover resemblances, which contain the secret of laws, draws parallels between poetry and painting, and is content. It would consider the application of the same laws of creation to literature and sculpture unreasonable, and to claim for dramatic literature especially the same dignity of sustained design, would be considered absurd. The *belles lettres* are presumed soulless; their own incentive, inspiration, reward. The dramas of Shakspere would be cited perhaps as the first instance in proof of how little even a high order of literature has needed either of motive or design, to ensure its success, and how much may be accomplished without the pretext of superior intention. "Conceived in a purely secular spirit by an actor and manager of a theatre, they offer abundant evidence, if it were needed, that poetic literature of the highest kind, can be created in the simplest spirit of construction without moral arrangement or motives of dignified design." These positions are worth testing.

Is dramatic art exceptional in claiming moral excellence

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as essential to its noblest form of manifestation? Is the spirit of Christian art, which lends to modern sculpture, painting, and architecture, its distinction, if not its supremacy, absent from the drama? Is it true that the loftiest faculties of the human mind applied to creative labour weaken, as the form of expression is improved and perfected? Can it be that the pen of the poet is less sacred than the pencil of the painter? Was Shakspere in the utterance of the most sublime and sustained morality, the purest and wisest sentiments, not less constrained by Apollo, than the Sibyl, "*fingit premendo*," and prompted by a not less exalted fervour and inspired purpose. Were his utterances merely irregular, and his complex and mighty monumental labours, alike defying criticism and comparison, disjointed imaginings, or at best the labourious efforts to please, of an affluent but prodigal mind. Was his wisdom poured forth in libation without controlling intention or even such purity of resolve as is claimed for any artist or architect whose work is to outlive his generation. Is there not rather evidence of sacrifice in various forms, which would imply a resolve set much above the exigencies of the moment, the love or the desire for transitory success, or even the mere pursuit of fame. And the question I now propose to discuss is the affirmation of a principle of design regulating all the poet's labours, and for the presence of such evident motives of construction as will pronounce the moral dignity ruling and regulating the artistic propriety of all his plays. For this, it is not necessary of course to claim for them, influenced as their production was, by so many circumstances, of time, opportunity, and place, the unity of a single work; nor claim for all, the distinction that may attach but to a part; but to inquire by some and by those chiefly on which his reputation hangs, if a merely secular motive is sufficient to account for their literary excellence

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and perfection, and whether an artistic zeal alone would have secured the unity of the moral form of his later plays.

Charges have been frequently made which impugn their purity, charges against scenes and speeches as eminently immoral and unnecessary, and thus subject to the severe imputation, that a love of impurity had prompted their introduction for impurity's sake, in violation of the exigencies of the play. A crime against artistic as well as moral propriety. These if proved would wholly hinder a belief in the moral purity of the author, or in the sanctity or consecration of his works. But, unfortunately for those opposed to the dramatic form of literature, these objections and charges can be easily explained away. The question remains not whether such enormities were systematically introduced, but the larger one, whether many seeming incongruities and imperfections, cannot similarly be traced, and referred back to a spirit of order, and arrangement, and to a grander unity of form, than is at first sight apparent. Some persons have assumed to discover a certain thread of order and form running through several of the later plays which has no reference to the necessities of the dramatic construction. To such a vital principle as circulates in a tree or plant, and sustains its vigour, health, symmetry, and perfection. If such a force exists, and the suggestion is not a fanciful one, the question remains, what is the crystallising law ruling these atoms, what the larger law of growth, regulating the form of these seemingly irregular creations? Or, in other words, are there considerations of a purely moral nature, which have imposed restrictions of design on the poet, superior to the mere order and arrangement incumbent on dramatic composition? Is the fire, which "lends the light which ne'er was seen by sea or land," the ultimate grace and perfection of all art, indeed, "the consecration," which must be supperadded to the poet's dream.

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The mass of literature, in criticism and commentary, on Shakspere, which has appeared within the last few years, by its extent would seem to illustrate some law that makes the area of a poet's orbit, depend on remoteness from the author's self. Of a variety and degree of merit embracing, as may be supposed, the widest poles of literary excellence—of wisdom and the want of it—a very broad and simple classification, may be applied to it. It is either complimentary or condemnatory. But on examination it will be found, that this opposition in criticism arises, less from peculiarity or causes existent in the author than proper and personal to the commentators. They divide naturally into a species of whig and tory interest. On the one side are ranged writers who proceed on the assumption that Shakspere, as a player, must have been, was, a very ignorant and unlettered person, stumbling by accident on beauties, and on a certain success in poetry, but still lamentably defective in all those artistic aids of training and scholarship, which are so necessary to noble poetry. It has mattered little what facts were opposed to them: the theory was just and perfect, and if the facts would not conform, it was no fault of theirs. On the other side, within the last few years only, have been marshalled a class—continually increasing—which proceeds on the assumption and foregone conclusion, that Shakspere was unquestionably the greatest genius that ever lived, and that, while amenable to criticism, a proper reverence is due to him. That as poets made rules in art, and rules in art did not make poets, it is necessary to weigh what are termed his sins against art and his defiance of art, before proceeding to judgment and condemnation. These two parties or factions in criticism have been loosely distinguished as German and English. The former uniformly manifesting a disposition of reverence, raising objections with

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diffidence, and dealing chiefly with the beauties and resources of the poet, in an analytic and philosophic spirit: the latter almost as uniformly criticising only to condemn; and using alike the memory of the poet and his immortal labours with a presumption only equalled by ignorance. It is obvious at sight that such a classification by nationalities is most imperfect; for the names of Coleridge, Charles Knight, Mrs. Jameson, Brown, and Collier, with others no less familiar, at once occur to impair it. But unquestionably it serves to mark a distinction in the general tone of German, as distinguished from English criticism, which as certainly exists—very largely to the credit of the former. Without proceeding so far back as that period, not very remote, when "Lear"—the sublime play of "Lear!"—was pronounced a dust heap, and some of its passages were accepted as jewels, lost in their irregular setting, it was the fashion and custom of every writer to consider the want of art and ignorance of Shakspere as matters understood. Criticism meant nothing but calumny, and the commentators were nothing if not critical. They discovered, or pretended to discover, geographic blunders, anachronisms, false quantities, broken metaphors, instances of obscenity, and rhythmical errors without number; and descended Harpies in horrid flight—

> ....."Et magnis quatiunt clangoribus, alias
> Diripiuntque dapes, contactuque omnia fœdant
> Immundo."

No critic was qualified for office unless he could contribute his quota of proofs of Shakspere's folly, or Shakspere's literary, artistic, or moral criminality. All this is now changed; but it would be difficult to say how much of the change has been effected or aided by German literary influences. It is now customary to speak of the poet more reverentially in print. But with honourable

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exceptions, such as I have already named, it is not unjust to declare that the tone of English commentary is still depraved, depreciatory, and most inadequate to the requirements and the dignity of the subject. That even where most apprehensive and devoted in its admiration, it neither attains the profundity, wisdom, nor devotion of Teutonic commentary, and that it is frequently marked by the utmost degradation of thought and feeling.

To Coleridge belongs the honour of having first among Englishmen assumed a proper attitude towards the poet. He was the first to approach the subject boldly, in a spirit of enthusiastic and unqualified admiration. His love gave him an insight, denied to less fervid or impassioned minds. He passed the threshold of verbal criticism, the courts of cavil and remonstrance; saw and understood the wondrous excellences before hidden. He was able to explain the marvellous artistic and dramatic propriety of the poet, no less in the delineation of the most occult and mysterious workings of the human mind, than in the exact relationship of circumstances to acts, as in real life. He became the first high priest. Gifted with a rare command of language, great enthusiasm, and versatility of thought and expression, combined with a subtle metaphysical acumen, and one of the noblest phases of the poetic intellect manifested in any man, in any age; he was peculiarly qualified, as inclined, to do service at the honoured shrine of the great master mind, of all literature. He tasked his resources for his office. His service was unconditional. His homage subject to no doubt; and in spirit as in wisdom, no successor, foreign or English, has more feelingly interpreted, or more lovingly appreciated, what the inconceivable wisdom of the wisest head of all ages, the myriad-minded man, wrote. But Coleridge did not assume to exhaust his theme, nor circumscribe the magic sphere of its great glory and perfec-

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tions. He mapped out some of its wonders, traversed its seas, ascended mountains, and with awe and an ever-increasing enthusiasm marvelled on the inexhaustible beauties by which he was surrounded. He lingered long in the enjoyment of its pleasures, and dwelt eloquently on "the deserts vast and antres wild," the "rare noises and pleasant music," the tropic luxuriance, and the unbounded fertility of this enchanted isle, raised by the hand of the arch enchanter himself. But it is to contrast two distinct lines of criticism ordinarily adopted, and not to dilate on either, that I refer to them. To contrast such criticism as that of Coleridge, Gœthe, Schlegel, Charles Knight, and Ulrici, with that of the ordinary routine of nineteenth-century-review-criticism; to shew how poor, mean, and derogatory to the poet's memory it frequently is; to point out its injustice, no less than its ignorance; how, proceeding on false assumptions, it drags the name of the poet in the dirt; how, pretending to judicial wisdom, it is merely partisan; how it practices base detraction under cover of exalted dignity, and thus effects slander, malignant, insidious, and dangerous—dangerous because insidious.

This may seem strong, if not unnecessarily severe language; yet it is hardly more harsh than the case warrants. By a systematic assumption that, because the poet was an actor and a manager of a theatre, he was necessarily not an artist; and by reasoning from such premises as though they were proved, no less injury has been done to the cause of literature, than violence offered to the cause of truth. Yet this is still the course: the criticism of to-day differs from that of the days of Malone, Johnson, Warburton, and Steevens, only perhaps in being less captious—in scattering praise more regally, and in pretending to a larger admiration. With more extended knowledge and information, it assumes base and specious motives

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in the poet, which could not have existed, or of which there is no proof. It has proceeded in one degraded instance further than this, but it need not be noticed. But it ignores the existence or even the possibility of existence of a moral design on the part of the poet. It is oblivious of the earnestness, the superior philosophic consistency and the uniformly elevated tone of thought of all the later and revised plays. It hands down the puritanic tradition intact, which associated Shakspere's name, because accident made him a player, with the vices and melancholy delusion of the foot-lights, and of a play-house—once abandoned to the court favour of Charles II. and the obscenities of Ford and of Congreve, Suckling, Wycherley, and Kotzebue.

From the altitude of German criticism, the step is a wide one. It is to pass from a landscape of pleasant sun, and sea, and sky, to a bleak and barren waste; the heavens no longer open overhead, into fathomless yet inviting depths; the music is hushed, the pleasant verdure is withered; all is scorched, arid, desolate, for the landscape is shut in by the miserable limit of the critic's self-sufficiency. There is no hope and no faith. To prove this we have only to take in special proof an instance of each. On the one side Ulrici, on the other an article in the *Edinburgh Review*, No. 90. The last, not so much from any literary merit, either of style or originality; but because it assumes to represent, and no doubt does represent, the opinion of many Englishmen, if not the general opinion in circulation in society. Ulrici claims for the poet the most refined motives of artistic authorship, not merely by assumption, but as deduced from the labours themselves. The author of the *Review* reiterates the assertion that Shakspere was a manager, no less than an actor; and that consequently his highest mission and effort were to fill his theatre. In

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their respective criticisms, these two critics proceed entirely, from these very different positions, making their arguments as far as possible conform with their premises. The one naturally appears to seek for evidence of superior motives and designs, the other brings a microscopic investigation to bear on all possible or conditional defects merely. As one endeavours to illustrate the exalted genius of the poet, exhibited in his writings, the other attempts to debase and degrade him by all means in his power; and this may be defined as a broad instance of the difference between the English and German spirit of criticism, and of the inevitable differences which must result from such opposite modes of procedure. M. Ulrici treats Shakspere as a poet—the *Review* as a vicious and worldly speculator.

Judging by such tests of observation and experience as must immediately occur to us, it is perhaps not unreasonable to suppose that Shakspere would have written to attract an audience, and please them when attracted. That his purpose was more directly to fill his treasury than furnish moral edification. It is a base supposition to believe that it stopped at this point — that his ideas were limited by the "Little O" of the Globe Theatre. No impediment existed to his combining the elegant and the useful, pecuniary advantage with artistic superiority. If there were, or if any of the later plays afforded a pretext for such a belief, in their incompleteness or defects, or from principle having been sacrificed to expediency, any argument of a moral design would be considerably impaired. It is asserted that as manager and actor, he was compromised to please his audience. But it may be asserted equally of any artist, or of almost every artist, certainly of every artist who has an end to achieve, that he works to please. He would say or do precisely the same thing in the same way, perhaps if there were no audience

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at all. But his aim is nevertheless the servant of his hope, which is, that he will be appreciated and understood, if not to-day, to-morrow; if not to-morrow, why then by those who come after. If he be a true artist he cannot make a sacrifice for mere temporary or present success. He renders the truth as it is to him for the truth's sake: if no one listen he is disappointed, that's all; but he will regard unpopularity as a possible defect. He will not attempt to suppress his intentions, but rather to overlay them, and give them superficially the popularity necessary to their efficacy. If Shakspere's plays had not been externally popular, they would never have been our wealth and possession, for they would not have been transmitted. The popularity was as necessary to their form as their form to the popularity; and it has been one of the problems of the German critics to discover, by scientific and careful analysis, how so profound a play as "Hamlet," of so much philosophic subtlety, founded at such depths, and amid the very shoals and quicksands of man's secret nature, should still stand serene and beautiful, popular to the public eye. They saw the stone, cut and polished, a gem admired by all, and they paused to inquire what was the power which so harmoniously blended ingredients so heterogeneous into such a compact mass? what the inherent force that gave weight and lustre to this diamond of light, and fused its flinty incoherent material into a pure and perfect chrysolite? Our reviewer is troubled with no such romantic speculations. He has a good wholesome contempt for refined motives and taste, and presumes that, as he has never gone to the theatre to acquire morality, therefore the artist has never been constrained by any moral purpose. This is not perfectly sequential. It would be hard to say that diamonds were fashioned with their specific qualities of density, hardness, and indestructi-

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bility, for the purposes of a levee, an opera night, or a dancing room. The Elizabethan was a refined and critical, though perhaps a dissipated pleasure-seeking age. The Elizabethan gallant, in his gay attire, peach-coloured silk hose, and satin doublet, his pack of cards, and his practice with the duello; who spent his mornings lounging at Paul's, his afternoons at the theatre or bear-garden indiscriminately, and his evenings in mad riot and potations pottle deep, was not a fervent worshipper at a shrine where morals and ethics were specially inculcated. There is no parade of morality, no open exhibition of it, no such moral essays as were permitted to the Johnsonian age, either from the excellent taste of the poet or other causes. The morality is not obtruded, but it no less exists. The reviewer disbelieves this, and thus illustrates the truism, that slander, to be efficacious, must be ignorantly and not maliciously framed. The calamity of some natures is to disfigure what they intend to embellish, as the Carribbean savage, by tattoo and war-paint, disfigures his person, which, if not beautiful, were better unadorned. The reviewer, to do him justice, has a very warm appreciation of the poet's merits; he eulogises him sufficiently to satisfy the most fervent enthusiast, but would simply ignore all the noblest claims that he has to the honest admiration of posterity. An innocent, well-meaning boy, playing marbles on the tombstone of a great man, will accidentally do more injury in effacing his epitaph than a fanatic and malicious foe. After giving in his adhesion to the rule of Shakspere as a dramatist, and to his superiority over the national dramatists of other countries, he establishes the dictum, "That the plays are not to be judged as poems; that the drama is a branch of art peculiar in itself, aiming at peculiar effects, and achieving its effects by peculiar means; that the very condition under which Shakspere writes, is to interest and amuse an

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audience; that whatever higher aims the dramatic poet may have in view, unless he amuses and sustains attention, he has failed." Again, amusement is the preliminary condition—if that fail all fails; and finally he asks the question he believes unanswerable, and which he has husbanded as a *coup de bataille*. "Did you ever, in the whole course of your life, book the two first seats in the boxes, or shield your wife from the crush at the pit door, under the impression that your passions were to be purified, and next Sunday's sermon anticipated?" I need scarcely remark, in reply to this last question, that were no loftier ingenuity manifested in the construction of any great work than is ordinarily brought to the contemplation of it, chaos would indeed be come again. If an intelligent apprehension of the motive of the designer, or even of his expressed moral be necessary in those appealed to, then the sun, and the stars, and the flowers by the way-side, have made their daily pleading since the world stood with little effect. If the degradation of an audience is the measure of a prophet's inspiration, then indeed are all the lessons of the Creator's wisdom read in vain, is the mission of the teacher ended, and the very idea of improvement shut out.

Accepting the reviewer's data, that the plays are not to be judged as poems, that the conditions under which the noblest literature of any age was framed, was primarily that of amusing an audience, and that this was its necessity, the "be all and end all" of its designer's purpose, it would perhaps be as well to add to them the reasons for such a belief as far as they can be discerned; and for the very supposition that Shakspere was a careless inartistic dramatist of wonderful power, facility, even genius, satisfied with the reputation he achieved in his own day, and neither emulous of honourable remembrance nor supreme distinction. They seem principally these:—

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1.—That he published no edition of his plays; and, as far as they are concerned, expressed no known desire or intention to do so.

2.—That if his sonnets are to be considered in any sense autobiographical, he entertained a belief in the immortality of his verse, which belief we know did not extend to his dramas. From this, and from the dedication to the "Venus and Adonis," in which he speaks of that poem as the first heir of his invention, it is presumed that he did not value his dramas for their literary merits, or found on them his claim to immortality.

3.—That he allowed piratical and incorrect editions of his plays to be issued, as far as evidence is afforded, without protest.

4.—That he adopted the plays of other authors—was content to patch, mend, and alter what he could, in a literary sense alone, so much better have accomplished wholly. That he accepted literary partnership with men of very inferior ability, not only in early life from necessity, but in the very latest period of his career from indifference or choice. In the "Timon of Athens," for example, first published in 1623, and "Henry VIII." The former play is bracketted with "Measure for Measure," by M. Ulrici, as one of his last plays, and its date of composition is assigned to the years 1613 or 14, Mr. Knight fixing it as late as 1610 or 11. In "Henry VIII." he adopted, as Malone first pointed out, whole speeches and scenes with little more than rythmical alterations.

5.—That apart from the doubtful estimation in which dramatic writing and dramatic authors were held, as is proved by the well-known anecdote of Ben Jonson being ridiculed in an epigram for publishing his plays as works. By Shakspere's touching allusion to the degradation of his profession, and by the wording of public documents

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in reference to plays and players, the poet was held in no literary honour by his contemporaries, or in any sense esteemed as a great poet. Lord Bacon does not refer to him in all his works; nor Sir Henry Wotton in his voluminous correspondence with almost every literary man of the period; nor Webbe, in 1586; nor Pemberton, in 1589; nor Sir J. Harrington, in 1591, although publishing works in reference to poets and poetry.

6.—The internal evidence of haste or carelessness, or presumed neglect in the diction, in the arrangement of scenes, or in the construction, and in the choice of plots already familiar, as well as in the repeated obscenity and undue importance conceded to the comic passages, &c.

7.—That the tenour of his life, from the contemporary evidence transmitted, was marked by no outward professions of sincerity or religious zeal—nor such conscious elevation of his own personal dignity or of the importance of his mission as attaches to the functions and offices of professedly moral writers or moralists, such as we associate even with the memory of Milton, Dante, or Wordsworth. That he came, as Mr. Emerson has remarked, eating and drinking, and that it could not be said of him that "his soul was like a star and dwelt apart." He was a jolly companion, a free liver, not inattentive to his religious offices; on the contrary, shewing a reverential nature in every aspect; but that he wore his religion easily is the uniform tenour of such anecdotes as refer to him. That he represented in this, what Macaulay has described as the national feeling of the time, when he expresses his opinion, "That the people whose minds were made up on either side, or who were inclined to make any sacrifice or run any risk for either religion, were few." This traditional character, handed down like the story of the deer stealing—of his holding horses at the theatre door

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for subsistence, and of his killing a calf in heroic style—has been, no doubt, the chief cause of his religious and moral dignity as an author having been impugned or doubted. Add to this the fact of his having been an actor, and of his reputation having literally to run the gauntlet of the next generation of Roundheads, who hated players with a bigotted zeal, as men of Belial, and we may understand how much of this opinion may have arisen. That prejudice, in his own and in the succeeding age, would have forbidden the idea, that a player would trouble himself with the inculcation of religious truths, or with doctrines for the special projection of moral and Christian axioms, is positive. Very few persons since the time of the Puritans would have dared to assert as much as this, or combat the prejudices which four generations have made law.

It will be seen that these arguments, which I have imperfectly catalogued, amount to little if united, and taken separately are likely to be estimated at a very different value by different persons. Some of them answer themselves or each other, or are not worth reply. To meet others would be impossible with the scanty evidence at command. Attaching little importance to them myself, I merely offer them as the basis on which the superstructure of very much modern criticism is founded. Having been a long time accepted as facts, the tone of disquisition usually proceeds from an assumption that the levity of construction they involve, is proved. They arm the battery aimed at the moral dignity of Shakspere's dramas, and no less at the memory of Shakspere himself, that I would wish, once and for ever, to see razed and scattered to the winds. There are a few others which I purposely omit, such as his asserted sacrifice of truth in his historical portraits of Joan of Arc and Richard III., to flatter the ignorant prejudices

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of his countrymen, or the reigning dynasty in the strain of adulation of part of Henry VIII., to please James I., and in his portrayal of Shylock, in deference to the traditional enmity borne by the mass of the people to the Jewish race. I believe them all distinctly capable of absolute disproof or explanation, but my time will not permit me to refer to them this evening, involving as these questions do conflicting historic and critical evidence of a voluminous kind.

In reply to all these charges the Germans point to the plays themselves for ample refutation. To the direct evidence afforded by their plot, construction, and moral design, for a complete absolution from any stigma of taste or neglect, for a complete proof of its injustice. I can do little more perhaps than this, or rather can do nothing so effectual as this, but as it may be presumed to be begging the question, I will briefly recapitulate such direct answers to these points as are afforded by indirect evidence, and arguments similar to those advanced in opposition.

In reply to the first statement. If we are to accept the testimony of the sonnets as an expression of the personal feeling of the poet which is now the generally received opinion in Shaksperian literature. The argument that he was insensible to fame is not merely disproved, but is shown to be directly opposed to the truth. The inference that he did not seek immortality because he did not publish his plays is merely a negative one, and is answerable by other statements on the same side. There is no proof certainly that he did intend to publish. There is just as little that he did not. On the contrary, a candid perusal of Heminge and Cundell's preface to the edition of 1623, will show that it might have been his intention to publish, but that his comparatively sudden death frustrated his purpose. He was a partner in the Globe and

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Blackfriars Theatres, chiefly if not wholly by authorship, from this fact, and that he alludes in his will to Burbage and Cundell, as his fellows, it is most probable that his brother managers still retained such an interest in his plays as would prevent publication. It is possible, as has been shown by Mr. Knight and G. A. Browne, that his wife retained this interest in his dramas and in the theatres, in addition to that portion the law allowed. That he did not in his plays manifest any craving for immortality is so far true, that he did not in them manifest any discoverable egotism, bias, or personality whatever, so far true and no further. From his dramas it would be impossible to predicate any single partiality, leaning, taste, or feature of his life or character whatever. For one statement in proof of any hypothesis of this kind twenty instances as cogent can be urged in denial. But if we can divine nothing from the dramas we can gain much from the sonnets. From these, or rather from the poem in the sonnet stanza, composed of the first 126 verses, and which is erroneously published under the title of sonnets, we have a large and important amount of evidence. Testimony so sincere in its expression, so earnest in tone as to demand a hearing. It has been contended against this, that the usage of the age admitted the production of a certain class of fictional poetry, of which the sentiments were as purely fantastic and imaginary as if applied to dramatic personages.

This is an argument which in no sense applies to these sonnets, or to this sonnet poem. They are many of them precisely on those subjects which neither invite nor admit dissimulation. That our author might profess an extravagant loyalty, affection, or love in verse is possible. Not greater than he is capable of feeling, it must be borne in mind, but greater than he experienced towards the person or persons to whom the verses are

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addressed. But there is none of the Euphuistic spirit of such poetry and of the age, manifested in these stanzas—even were it probable, which it is not, that the writer would profess a vaunting self confidence, ambition, or egotism which he did not feel. The emotions delineated are just those which men ordinarily conceal, or make no boast of. They have the variety in great part of confessions wrung from a man against his will and in spite of himself. Again their identity in feeling with many of the sentiments and expressions in "Hamlet," I accept as an additional proof of their personality. It may be urged that *Iago's* super-subtle Venetian hypocrisy and double dyed villany are as much the poet's as *Hamlet's* metaphysical speculations. The microcosm includes both good and ill, the entire extremes, and where those extremes merge into each other. But this is true of all men with this difference; that the noblest good includes the worst ill; the worst ill includes only itself. The speculations or doubts of *Hamlet* were not possible to *Iago*. In all cases what is requisite to be known in an analysis of character, is not what a man contains, or what is possible to his mind, but which side of him (to use a by no means elegant phrase) lies uppermost. Without pronouncing positively, on a point, which I am not qualified to decide, I am inclined to believe that the loftiest intellectual aspect of the poet is shewn in "Hamlet," indeed that it is the most elevated in its purely intellectual features of any character, ancient or modern, projected in literature, or in universal history. With this belief, and with this key in my hand, real or imaginary, I am to suppose that those expressions in the sonnets which assimilate in feeling and thought with those of "Hamlet" are fair exponents of the prevailing aspect of the poet's mind. Had the sonnets expressed an exaggerated scepticism or infidelity, I should have doubted their authenticity, not

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from prejudice, but because the tendency of Shakspere's mind could not have been to scepticism of good like Iago's. "Hamlet's" very doubts dissolve the base questionings of the Italian, for the greater not only includes, but rules the less. It was in this sense only that the epithet of "universal poet" is a just one, as comprehending the lesser spheres—to be universal in mind is the distinction of humanity, as it is of all else, to include everything beneath itself, within itself.

To turn to the sonnets themselves, Shakspere, no longer appears the arch magician and enchanter, like Prospero, passionless, directing powers of a loftier and more etherial nature to execute his behests. He has buried his staff certain fathoms in the earth and is human. They are full of the repinings of conscience, of the throes of ambition, of the whispering of hope, such as beset us all; of contrasts with himself, of his fortunes, and defects, with others, all combined semblably together by that tinge of melancholy so marked in *Jaques* and *Hamlet*. Mr. Knight thinks but few of the sonnets united, and treats them in the only part of his criticisms with which I disagree, as isolated jottings on different themes. I on the contrary coincide with Mr. J. Brown, that the first 120, are clearly and indissolubly, one poem. A poem in a stanza of which there were precedents in the poetry of the age. I do not insist on more than the first 126, because these alone are material to my argument. Mere's reference to Shakspere's sugared sonnets, 1599, may have referred to others, and the two surreptiously published in 1590, with the "Passionate Pilgrim," do not fall among the 126, though that would not materially affect their unity of construction, though it would impair the present belief in their dedication.

In the 17th stanza the poet, after praising the subject of his song, says—

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"The age to come would say this poet lies—
Such heavenly touches ne'er touched earthly faces;
So should my papers, yellowed with their age,
Be scorned like old men, of less truth than tongue,
And your true rights be termed a poet's rage,
Or stretched metre of an antique song.
But were some child of yours alive that time,
You should live twice, in it, and in my rhyme."

In the last couplet of the 18th stanza—

"So long as men can breathe, as eye can see,
So long lives this, and this gives life to thee."

and in the 19th—

"Yet do thy worst old Time, despite thy wrong;
My love shall in my verse ever live young."

In the 55th, absorbing the whole stanza—

"Not marble, not the gilded monuments
Of princes shall outlive this powerful rhyme;
But you shall shine more bright in these contents
Than unswept stone besmeared with sluttish time.
When wasteful war shall statues overturn,
And broils root out the work of masonry;
Nor Mars his sword, nor war's quick fire shall burn,
The living record of your memory.
'Gainst death and all oblivious enmity
Shall you pace forth, your praise shall still find room,
Even in the eyes of all posterity
That wear this world out to the ending doom.
So till the judgment, that yourself arise—
You live in this, and dwell in lovers' eyes."

This may be fanciful, but it seems to me very like sincere belief. Not to multiply examples by further quotation, it appears to me that any person who can, after their perusal, declare that the poet had no legitimate or natural craving for immortality, must be a bold man. The occasional humility they disclose, the doubts, the quick sense, of wrong, of human injustice, and of the prevalence of evil, so far from weighing against this testimony, authenticate it. He has an undoubted faith in

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the eternal remembrance of his muse. To presume that he believed his sonnets alone entitled to this distinction, is to presume such an absence of discrimination and judgment in the poet as would be well nigh impossible, if not absurd. It is scarcely less, to assume that they were simulated expressions, and that the circuit of his great soul was bounded in itself, and lacked, that last infirmity of noble minds, ambition.

On the evidence, then, of these verses from this sonnet poem, which by their undoubted authenticity, and because they do not fall under the restrictions proper to the plays, I believe I am justified in using, I assume that it is positively incorrect, and even ridiculous, to assert that Shakspere was not sensible to considerations of fame. There is no proof extant, but the negative one adverted to, that he was so far exceptional to our common nature as to lack that ordinary self-consciousness attendant on all genius, perhaps on all intellect whatever.

Next, the allusion in his dedication to the "Venus and Adonis" as "being the first heir of his invention," to which, however, very little attention need be attached. Mr. Knight and Mr. Brown have each explained this expression fully and reasonably. Shakspere may have written nothing completely or entirely for the stage before this poem, or he may have written it at a very early age, though he published it many years after, when he found a patron to whom to dedicate it. In either sense it would have been the first heir of his invention; and it is not necessary therefore to assume that he considered his dramas inferior to his poems, and in this deferred to the prejudice of his age in its preference of this kind of composition. The fact of his not having written an entire play at this date solves every difficulty. The third objection, that he allowed the issue of piratical and incorrect editions of his plays without protest, which I may couple,

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for despatch sake, with the fourth: that he adopted the plays of other authors—old manuscripts from the property chests of the theatre—and accepted partnership in his labours with humbler men, early and late in life.

The reply to these charges is, that it is obviously improper for us to attach to productions of this kind the rule which we would apply to laboured literary effusions of the present day. The whole cycle of thought is changed. The nature of the audience, the conditions of publication, are widely different. The same laws do not hold with respect to artistic results produced under opposite, almost antagonistic circumstances. The fact that a result is produced, in the direct exercise of a profession for subsistence, or wholly for reputation's sake, materially alters the case. A difference also should be estimated between that which is produced, in the assurance of celebrity, and that which is wrought only in the hope or belief of fame, though that belief be of the strongest kind. To illustrate by a sister art, Mr. Chantrey, in his later years, it is asserted, on good authority, allowed works to issue from his atelier which he had worked on very slightly, or not at all: and this from two causes—one, that though there was great difference between his labours and that of others, that difference was not likely, in the general ignorance which prevailed in art, to be soon detected, or if detected, seriously regarded; the other, that general usage sanctioned it. The fraud was trivial, because the persons apprized of their loss could not estimate the extent or even nature of their wrong. The fraud was not considered criminal, no one being injured by it. It ceased even to possess that element of deceit which would justify my use of the word, though in every other sense it is fraud to accept pecuniary consideration for that which is not what it professes to be. Fashion preferred what was not the labour of his

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hands, but which was assigned to him, to that which could not be so bestowed. It has seemed to me that the dramatic poet was in the condition, in reference to the Elizabethan age, that a sculptor was to the Georgian era. He appealed directly and chiefly to a select few, whose judgments not infallible, were easily satisfied. Like an orator, an improvisatore, a sculptor, or a painter; and not like a modern literary man who knows that every word will be duly published and read, criticised, punished, or rewarded. In the exercise of his profession he wrote certain plays in haste for immediate exigencies without, I will not say a due, regard to the perfection of the result that he held in reference to other of his labours. That, in fine, he wrote for a livelihood, as well as for fame. As Mr. Chantrey produced one or two of the noblest portrait-statues of modern times, and several master-pieces, marked by a careful and conscientiously achieved excellence, greater artist, Shakspere himself, laboured on some of his works to give them the perfection he desired, and to acccomodate their theme to the desires of his mind.

That he subsequently altered and amended many plays produced in haste, in youth, or for specific occasions and representation, is now proved. In this he might have presumed, being placed in similar circumstances to a painter or a sculptor, that his fame would be vindicated by his great works, and that the lesser ones would drop quietly into oblivion. To suppose this, is to presume no indifference in him to the nobler plays. The association of an artist with his labours was much less perfect once than it is now, and when great painters took pupils, and established schools, was not as fully understood. If it were customary for poets or novelists in this age to follow such a usage, we should hold, as a rule, much less scrupulous identity between an author and his works.

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That he did not allow his dramas to appear piratically, without protest, is proved by—that most efficient protest of all—a corrected edition, revised by his own hand, the "Hamlet" of 1604. That he did not subsequently publish other revised plays, is explained by the fair supposition that his co-partners were opposed to the publication of his plays, as interfering materially, as they might suppose, with their rights, and with their popularity for the purposes of representation. Whether he made any other protest cannot be known. That he did not take any active or vigilant measures of repression we might almost assume from his characteristic gentleness. But there is nothing to shew that he was insensible to the piracy, or that he did not adopt such means of prevention as were practicable, or consistent with his nature.

Next, as to his adoption of plots and co-partnership in authorship in advanced life, and in the best season of his literary magnificence, this seems true but of two plays—"Timon of Athens" and "Henry VIII." It may be that these plays were altered after his death, or were left unfinished in the sense in which they now appear; or that, fixing them as among the latest of his plays, and assigning to them the dates of production of 1613–14, or 1611, Shakspere may have then been resident at Stratford or visiting there. "Henry VIII." was hastily thrown together for a particular representation, and transmitted to his partners in London, with the intention of subsequent revision. If the poet was the William Shakspere who appears in the militia roll for the hundred of Barlichway in 1610, his residence in Stratford would be proved, which would render such an event possible, presuming the date of the first representation of "Henry VIII." to have been as early as it is fixed by Knight. Whether it was altered or interpolated by Jonson or

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some other hand, is not quite manifest nor under what circumstances; but it is sufficient to shew that such an interference in the construction or versification was not the rule, but purely exceptional and explicable on very many grounds.

His adoption of plots, or even of stories, already dramatised and popularly known, must appear quite natural, when the circumstances under which he first entered the theatre are known, and the undoubted demand that would exist for his labours to satisfy the necessities of the theatre. His best justification is to be found in the admirable use made of them, and in the fact that the stories themselves, no matter whence or how derived, served his purposes as well as if issued from the coinage of his own brain.

That he was held in slight esteem as a poet by his contemporaries, is not a very serious charge; the fault was theirs, not his. It must be admitted that he was not honoured by his age as a poet, although placed in the first rank as a dramatist. Daniels was preferred when he applied for the post of master of the revels; and, in the words of a modern author, he might have had "to veil his bonnet," not only to Spenser, but to Daniels, and Chapman, Harrington, and Fairfax. But what of this: the poet laureates are not always the best poets of their day; nor is the noblest author always recognised by the public. Speaking of the age, Mr. Emerson remarks, "since the time of Pericles there was never any such society; yet their genius failed them to find out the best head of the universe; our poet's mask was impenetrable—you cannot see the mountain near." This certainly must be the explanation, rather than that he was slighted, because neither a moralist nor an original author, he was unquestionably the most moral, as he was the most original writer of his day. And the cause

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of his not receiving honour at the hands of his contemporaries, more probably arose from the fact that the puritanic prejudices against players were already in full force, and that his social position in the then existing state of society, bound as it was by the bonds of feudal law, and encumbered by its fetters, hindered his recognition. "He was a Galilean," and no good could come "out of Galilee." It might perhaps be questioned that a mere matter of worldly position would influence his estimation as an author; but we have only to consider how heavily it weighed on an author who lived within this century, Robert Burns, to perceive that it might not only do so, but would be most likely to do so. Extraneous considerations weigh in every administration of justice, blind the goddess is. If the resources of a powerful, even gigantic mind, were crippled in the nineteenth century, its popularity limited, its results held cheaply till twenty or thirty years after death, how much more may we suppose the influence of an author indirectly injured in the seventeenth century. The ignominy that then attached to his pursuits must have dulled the vision of the most far-sighted and impartial. Educational acquirements were valued then, even more than they have been since, to the prejudice of genius—man's art was honoured above his Creator's. The mere pretension to erudition, or to academic accuracy, as in the case of Ben Jonson, whose learning was none of the profoundest, was sufficient to give an ascendancy in reputation; but neither Jonson nor Shakspere could be honoured as college bred. Shakspere was known to be an actor, therefore no scholar—a glover's son, consequently no classic. Lacking classical lore, he lacked art; was a mere unskilful and inartistic, though eminently successful, witty and eloquent playwright. Like Burns, he was regarded as a literary phenomenon. He was a comet of even a higher

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order. This strain of reasoning, the key to so much subsequent criticism, was no doubt the cause of much contumely expressed in life toward the poet, productive of much unhappiness, and the instance of those painful and melancholy broodings, which, in his sonnets, have escaped into print.

Finally, as to the internal evidence of haste or carelessness in the diction, but chiefly in the construction of the plays, the "want of Art" in fact, and the absence of moral intention, manifested no less in the poet's life than in his plays. That point indeed which our Reviewer insists on, when he supposes that, because Shakspere was compelled to write a drama that would act, it was necessary to render the popularity the chief aim, and make moral considerations secondary, rather than construct a drama artistically perfect; framed in moral harmony, elevated by moral dignity, and then trust to the result for its popularity. To inquire if the idea of amusement has been held predominant? The charges of haste and carelessness are easily disposed of by a mass of convincing evidence accumulated from all sides: First, because alterations have been frequently made in the dialogue and composition, with a view alone to their literary, and without reference to their dramatic, merit. Next, that very many of his plays are not suited, indeed, never could have been suited, for the stage; that very many of the scenes, even in those days of court masques, were impracticable for stage purposes; that they were so designedly, and not accidentally, or from want of art, appears evident on investigation. If the "Tempest" were ever, or under any circumstances, a good acting play, as Mr. Thornbury suggests, but which I very much doubt, it must be admitted that the "Midsummer Night's Dream" is amenable to no law of stage propriety. The "Winter's Tale,"

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and "Measure for Measure," are but partially fitted for representation: indeed we may boldly say, of all these four plays, that their very worst aspect is that of dramas or acting plays. There is in neither of them the attention to plot, to the balance of situations, to progressive development of the story, to that unity of thought necessary to enchain a spectator, which are among the first laws and rules of dramatic composition. They violate some of the most important of these conditions as completely as the productions of the merest tyro in playwriting, and seem almost to justify what Hume characterised as "his total ignorance of all theatrical art and conduct." In "Measure for Measure" there is not only a story without a hero, and a play without a striking situation or an artistically-wrought *denouement;* but the principal character who is to mate with the heroine, opens the business of the play in defiance of the simplest canons of construction. But Shakspere's plays are full of faults of this kind—of rash and unadvised endings—of dreadful catastrophes—of heroes going, as Dr. Johnson remarked, mad without cause, and recovering without reason; and such unskilful endings, that the virtuous die off with the guilty, or perish while the vicious survive. It needs no capacity to discover this, a child might discern it. They are what Mr. Hume pronounced "the irregularities and absurdities of the poet," so patent as to create a wonder that an artist so accomplished in some respects, should have discovered so culpable an ignorance in others. Not unjustly either when we consider with what subtle knowledge, and blended artifice and art *Lear* is made a heathen, the better to illustrate his irrational, violent, and unchristian spirit; *Iago*, an Italian—of the very age and country of Machiavelli—and *Othello*, a Moor; or when we perceived the labour and discrimination shewn in the alternate balance of all the characters in all

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his plays. The appearance of ignorance on the one hand, and of consummate art on the other, are evidently irreconcilable. German criticism declares that like his anachronisms they are committed of set purpose and design, for the furtherance of grander aims and principle.

Such a consideration as this would necessarily disprove haste or carelessness, but evidence to the purpose also exists of a more pertinent kind. In the quarto edition of "Hamlet," of 1604, the speech of the King is pointed and changed from that of 1603, being, Mr. Knight has remarked, too refined, and not sufficiently marked to distinguish it, either in diction or in thought, from the language in the body of the play. This alteration is a purely literary one; and, although it might be maintained that the entire alteration and increase of this edition, by which it was "enlarged to almost as much again," partook of this character, it is certain and indisputable, that changes were made purely from artistic and moral motives. In the edition of 1603, Hamlet plots with the Queen the destruction of the King: this would act as well, but it violates the metaphysical consistency of the play. Tracing back the whole series of alterations and refinements on Belleforest's novel and the old story of Saxo Grammaticus, it is not too much to say, that the hero of the Chronicles, with his two wives, would have been no less theatrically interesting than the present melancholy, vacillating, sceptical *Hamlet*. The wonder perhaps is, that a play, with such a hero and such a catastrophe, could be or remain popular, for the mere purposes of theatrical representation. The *Ghost*,* or the variety of incident offered, may have each contributed to this result; but it can scarcely be doubted that the Prince, who goes mad

* It is just worth while to remark, that in "Hamlet" the *Ghost* visibly appears because he has a message to communicate; but in "Macbeth" he ought not to be seen, for his action is entirely different.

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"so unreasonably," spite of this inconsistency in his character, has been always the centre of interest. It would have satisfied all the dramatic critics, and have rendered the play much more methodical and consistent, no doubt, had he been a trim, courtly personage, talking magniloquent blank verse, in a superb grandiose manner, without salient points, or, it must be added, individuality. But this would have violated that larger consistency and order of construction, necessary to the elucidation of abstract and metaphysical principles such as the poet desired. The play would have been as popular no doubt had it been more according to rule; but the attempt was, and the triumph has been, to make such an immethodic, irregular production, popular and attractive too. Success was attained, not by snatching a grace beyond the reach of art, but by an inherent order and method which, if not apparent to every eye, no less existed. An oak, even if not trimmed like a Dutch yew or a box hedge, may still possess vital order and consistency, though perhaps not to Hanseatic minds. In "Romeo and Juliet," another irregular play, the whole of the incidents and characters seem so naturally bound together, diverse as they appear at first sight, as to resemble those famous temples, which by the removal of a column come crashing down in hideous ruin. Touch but a spring and all the construction falls to pieces. Every thing is in order, and from first to last not a word could be spared without injury. The story is of violent and unreasoning, violent because unreasoning, passion; and of an equally impetuous love and hate. The ardent *Romeo*, with an impulsive and riotuos desire, alternates between the heights of a blissful and most passionate love and the depths of the most profound despair. His course is between the utmost extremes. He seeks death as he sought his love; his life and his hopes are as violently

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frustrated; for he alike disregards the wisdom of others and the dictates of his own judgment. All is impulse and passion, leaping to excess, from gaiety to death, from affection to hate, from joy to despair. The air is heavy with wrongs, causeless feuds, mad suspicions, rash and unadvised paternal rule, and impulsive devices. All is framed into one harmony of complementary love and hate, happiness and woe, which beget each other, and which end as such unreasoning acts must ever end—most grievously. There is order in this, though perhaps not of the Turkey-carpet kind.

In answer to the charge of haste or carelessness, nothing less than all the later dramas ought properly to be produced. The only circumstance which could for an instant substantiate the charge, is the rapidity with which these wonderful plays were produced. For intrinsic evidence of haste or indifference we should seek in vain. Unless entire passages were finished at a blow, struck into life, Jonson's praise of "true filed lines" must have been more exact than the assertion that "Shakspere never blotted a line." So accurate seems the finish, so unwearying the care, that to expunge a word from some of the plays would be to strike a splinter from the solid and concrete mass, and leave a flaw as if a fragment had been rudely broken from its graceful and symmetrical outline. The charges of carelessness are indeed as unfounded as Cecil's—"that he had a low and licentious taste," or Gifford's—"that he was the corypheus of profanation." The contrary is on all hands demonstrable. Such charges could only have arisen in a criticism of parts, by which a fraction being seen, the incompleteness in that which was necessary to the perfection of the whole, was misunderstood. What was designed with profound intent was thus attributed to ignorance. It was in this spirit that Cibber, and Tate, and Kemble, reconstructed

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Shakspere's plays, hoping to improve them by giving them more orderly form and happy endings. It was unfortunate that their laudable desire was frustrated, and that their terminations of the "single married, and the married happy," of "vice punished and virtue rewarded," orthodox as they were, were not accepted. They made the plays more representable than they were before, and thus, if they could not command success being mortal, perhaps, they deserved it. The public still prefer Shakspere's plays as he wrote them, bad acting plays as many of them no doubt are, though it requires some nerve to state it. Human nature is inconsistent, and perversely prefers these unfinished examples to more finished ones. Rude and imperfect, the fragment of an elder time and of a colossal race, they would prefer the statue as it is, than finished by meaner minds. The hand of genius has been upon it, and as it is, it must remain till the end of time.

With reference to his character, we are so dependent on tradition, beyond his works, for all that we know of Shakspere's life, that it is very difficult to advance any thing in favour of his personal disposition that could either add to, or take from, the merit of his labours. He was esteemed and honoured by all who knew him, most by those who knew him best. The epithet of gentle Shakspere, the testimony of rivals, the affection of friends—captious and irritable as history knows them—is sufficient to attest his unusual amiability. Beyond this we know little. His purchases prove him prudent—his will pious. For the rest we must turn to his works. They offer voluminous evidence, and it is perhaps more rational to turn to his labours for vindication of his life, than to his life to impeach his works. It is possible that he was not a precisian, but that his was an earnest mind, confirmed in principle and sustained in

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honour, on the basis of all virtue and goodness, there is now happily no real question. Mr. Emerson remarks, in reference to his works, that he was strong as nature is strong, without emphasis or assertion; and this is no doubt as true of his life. The moral beneficence imparted to all his most fully delineated scenic characters, no less than the predominant and sustained tone of morality in such plays as "Measure for Measure," "The Merchant of Venice," is perhaps the best testimony of his pure, noble, and loving nature. To contrast with the insinuations and charges of immorality, obscenity, and profanity, urged by Gifford, Birch, Bell, and others, there is some accidental evidence borne by Coleridge and Dr. Proctor, which, being spontaneous, is much to the purpose. Coleridge remarks, "Shakspere at all times kept the highroad of life. He has no innocent adulteries, no interesting incests, no virtuous vice; he never renders that amiable which reason and religion teach us to detest, or clothes impurity in the garb of virtue." Dr. Proctor adds, "he never tampered with truth, never threw down the boundaries between vice and virtue, never strove by voluptuous images to excite the passions, nor by fallacious arguments to ensnare the mind or confine the intellect." It is, however, a work of supererogation to defend, not only by external arguments, but by extrinsic testimony, a question on which the plays must be the best witness, their own noblest expositor. To the dramas must we look for the proofs of their own moral dignity. For the proof of those moral and religious considerations, and of those Christian doctrines so marvellously expounded, so infinitely applied, so positively inculcated, that the German critics insist on. If as a literature it combined the utmost fertility of intellectual resource, with an even more than human vigour, eloquence, humour, fancy, accuracy of knowledge, aptness of illustra-

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tration, and gorgeous imagery, lacking the moral consolidation of lofty principle, it would still, as a modern and Christian literature, be defective, undeserving the high honour awarded to it by many minds, and that place that it would otherwise claim as the noblest literature of all time.

In proceeding to an analysis of the plays, it is only fair that we should bring to the task such impartial and unprejudiced consideration as we should, under similar circumstances, render to any other great and world-famous work, or system of art. That we should weigh what has been sacrificed, as well as what has been achieved, in deference to a fixed plan; what has been cut away, what rounded, what adorned; the diminution of this ornament, the addition to another; the refinement or chastening of a third. To trace the gradation by which it arose completely, as it stands perfected before the eye. To accomplish this, it would, perhaps be the simplest course, to examine one of the dramas in detail—"Measure for Measure." One of the least successful of the acting plays, of the most irregular structure. A play which will best illustrate the want of art asserted by one side, and the presence of the noblest art insisted on by the other. The story, as we know, is a simple one. A governor of a people leaves his realms to the mercy and rule of a deputy, who, under a seeming show of virtue and precision, is yet unchanged at heart, and is destitute of that soul of honour, and integrity of purpose founded by reliance on superior power. He attempts to walk alone, in his own unaided strength, and falls. Rigid in the punishment of offence, unsympathetic and inflexible, a ruler and not a father to his people, he yet commits and with peculiar circumstances of aggravation, the very crimes he so severely visits, and is finally punished by

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failure, detection, and disgrace. There is little in the plot to recommend it dramatically, or in any incident it discloses. If we deny to it any merit beyond that of pleasing an audience, and accept the Reviewer's dictum, "If that fail all fails," it is, I cannot but think, a lamentable failure. It is, however, animated by the loftiest purpose, as it is pregnant with the noblest eloquence.

The play opens with the transfer of authority by the Duke, and with an explanation of the trust thus confided to the unworthy deputy. From the deposition and acceptance of this power, to the end of the play, scarcely an expression falls that does not refer to the influence for good and evil, thus vested, thus to be abused. It contrasts man's rule with divine government. How—

> "Man, proud man,
> Dressed in a little brief authority,
> Most ignorant of what he's most assured,
> His glassy essence—like an angry ape,
> Plays such fantastic tricks before high heaven
> As make the angels weep."

The play revolves round this title of "Measure for Measure," of man's measure and the Christian measure, without divergence, as closely as if it were an acted charade, or a sermon to this text.

Mr. G. A. Brown, in 1838, prior to the publication of M. Ulrici's book, and without regard to any hypothesis, remarked, "unless we could believe that Shakspere could write a long dramatic treatise on a subject without intending it, unless, in fact, he knew not what he was about we ought to regard the fable of "Measure for Measure," as adopted by him for the purpose of canvassing the argument on chastity and incontinence." M. Ulrici proceeds much further, and in illustration of a preconceived theory, analyses the play, not as different from other plays of Shakspere in this particular, but as one of many, subject to the same laws of composition. To a system by which

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the arrangement of plot and design, characters and language are subordinated to the discussion and illustration of some great moral truth, or the series of truths dependent thereon. That this rule sits ever above that ideal beauty of structure supposed to be the crowning glory of created work. Like a vertebrated backbone, running through all the diverse characters and situations, uniting them by a common motive, with one purpose—maintaining vitality, preserving vigour, diffusing health, energy, command, from the seat of life itself. The human agents move in seeming confusion, but in perfect order in deference to law, like a swarm of fireflies now tangled in a braid, and anon flying out into the darkness as sparks struck from a common centre.

In this text of usurped honour, without that grace which should wait upon authority, of humility without faith, or in the aspect which M. Ulrici prefers translating it, whose true sense is that of the beautiful petition in the prayer—"Forgive us our trespasses, as we forgive them that trespass against us"—lies the unity and consistency of the play. Not the merely external and superficial semblance of order—but that diviner order, superior to all art—which binds the play together in harmony, and which imparts to it the noblest, because a purely moral, grandeur and dignity of design. The general burden of the story is so strictly diffused, that the play seems the only practicable or possible illustration of its meaning—the only means of conveying or expressing in its different aspects, a text which it would be otherwise impossible to fully represent. There is always a certain amount of falsehood or inaccuracy, in the ordinary expression of any moral idea. Such ideas are indeed incapable of direct statement. In this it is the Shaksperean Drama, finds its meaning and justification; the moral idea which must always remain a riddle in words, is soluble in action.

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In conclusion, whether we consider the plays of Shakspere merely as dramatic monuments, or as wonderful essays in dramatic form, illustrating the noble morality, derived from Christianity, we must consider them no less wonderful than unique as intellectual achievements. Their daring disregard of encumbering classic rules, their ready adoption of every phase of action by which the free will of Christian belief can be illustrated, prove their right to be recognised as complete an embodiment, of a perfect art, as the cathedrals of the middle ages of gothic architecture. If, beyond this, we suppose them to possess a noble strain of morality, and to have for their purpose the doctrinal inculcation of great truths, we must assign to them that position in our honour and reverence, which they have long held in our affection and admiration. In its illustration of that best study of mankind—man—it is perfect. Its originality is not less wonderful. It is the only branch of literature that is native, and to the manner born—the only heir of our invention begotten to us. Our histories, biographies, architecture, painting, sculpture, oratory, are all founded on antique models, or directly imitated from them. Shakspere's drama is irreproachably English. There is no counterpart beyond the seas. Newton's genius is not as purely our own. His modes of deduction had been practised by inferior minds before and since. His instruments, the mathematics, were common to all ages and races of men. His results have been verified as his wisdom can be traced; but, in the words of Mr. Emerson, Shakspere's mask is impenetrable—"He was inconceivably wise—all other men conceivably; we can in some sort nestle into the mind of Plato, and think from thence, but by no means from that of Shakspere." Reverently looking at what he has bequeathed us—at its literary originality and completeness—at the external and seeming dissonance, so profoundly united into harmony and

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a concord of sweet sounds, by subtle principles of design, no less wise than mysterious—we must, I think, be convinced that reverent criticism is alone admissible. In the great world to which these plays assume to hold the mirror, we frequently perceive the existence of apparent incongruities and defects; either from a part only of the chain of which these form a link being disclosed, or from inability to understand what is seen without the key of that which is concealed, and our criticism is often tempted into a spirit of doubt as unjust as it is erroneous. A similar disposition and presumption with Shakspere is no less likely to lead us astray. His plays are as truly to me inapproachable in their moral as in their intellectual, poetic, or artistic aspects.

Nearly all the later dramas will be found to have a distinct theme of religious and Christian import, to indicate their moral dignity. An unceasing purpose runs through their story, disproving absolutely all that the Reviewer urges, and that no consideration of expediency affected the poet. So far from his life being that of a mere theatrical manager's—writing dramas whose preliminary purpose was to please—I prefer believing, with M. Ulrici, that his was a genuine poet's life, wholly devoted to free poetic creation and the gradual development of his art; and being, moreover, animated by the most heroic religious spirit that the middle ages present to us. If it is legitimate to the most exact reasoning to infer from construction the existence of design, it is no less legitimate to infer the character of that design. Accepting such an axiom, we must be convinced, on investigation, that he was not a wild and inexperienced genius, nor a man of weak resolves and ambition; but that he was the greatest, the most laborious architect, the most noble designer, the most pure-minded and Christian poet, that the world has yet known.

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For myself, owing to the largeness of my subject, I can but express my regret at the imperfection of what I now urge. Without hoping to do justice even to my own belief, I have attempted to record some of my convictions, and can only apologise that they are not more worthy of the subject.

I look upon the poet as one who wrote, believing himself immortal; as one who, in first conceiving the most perfect aspect of feminine loveliness, taught virtue. For to create an image of purity is to teach purity. As one who worked in his master's eye; as the best translator of the Christian doctrine,—the noblest interpreter of its law, scattering its spirit without reference to sect or party. Offending no scruples, he appealed to all, on the merits of those truths which all men equally agree to hold and honour. On the subjects of Authority, Mercy, Beneficence, Female Virtue, Purity, Chastity, Selfishness combined with Intellect, the Spirit and the Letter of the Law, Self-denial, Ambition,—on all these texts his sermons are the best extant.

He shot the clear light of his intellect into those mysterious depths of gloom and melancholy that most try the philosophy of the thinker, and shew that increase of wisdom is indeed increase of sorrow. He was the light of the new reformation, rising resplendent on that old horizon of prelatism and feudal law. He lit all that was excellent in the old chivalry, its splendour and picturesqueness, its love of poetry, and of nature, into new beauty by his beams. The old rule of might was at an end; and though the progress of the truth was to be slow, its sun had not less arisen. Its light, borrowed from another sphere, was radiated with a warmth and glow suited to the race it was to cheer and cherish. As we feel the glory of the sun, not by looking at the great orb itself, but by the splendour it sheds abroad, the lands it

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illumines, the wealth it diffuses, the forces it generates, the vitality it quickens, the colour it imparts, we perceive more the value of what he taught, in his teaching, than in its direct manifestation and simplicity. That as the sun veiled, the sun reflected, refracted, broken into dazzling rays, shed abroad in polarized effulgence, scattered and diffused in mellow and subtle tints, is most beautiful to the eye and to the heart of man; the doctrines which Shakspere teaches and illustrates are best seen in their beauty, their delicacy, gradation, and tint, in his exposition; and of Him, finally, I would say, with the poet:—

> "In my mind's eye a temple like a cloud,
> Slowly surmounting some invidious hill,
> Rose out of darkness. The bright work stood still,
> And might of its own beauty have been proud.
> But it was fashioned, and to God was vowed
> By virtues that diffused in every part,
> Spirit divine, through forms of human art."

In an animated discussion which followed, it was remarked by Mr. Brooke, that the most beautiful touches of truth and morality pervaded Shakspere's works from one end to the other. They contained, certainly, expressions which would not be tolerated in any writer of the present day; but allowance must be made for the language of the age, and the usages of society in the reign of Elizabeth. They must also recollect another thing—there were no insidious recommendations of vice in Shakspere. It was seen in its naked deformity; no voluptuousness of language was visible. Shakspere's originality and knowledge of human nature were the admiration of all readers. Two illustrations might be given: in "King Lear," while the pretended madman, *Edgar*, rambled on, the real madman, *Lear*, was always recurring to his cause of grief. The other was the admirable introduction of a pause. A writer it was remarked,

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who did not know so much as Shakspere did, would most probably have introduced some bombastic speech instead; but the poet left it, by this pause, to the imagination to fill up what was passing in the speaker's mind:

War. See, how the pangs of death do make him grin.
Sal. Disturb him not, let him pass peaceably.
King Henry. Peace to his soul, if God's good pleasure be!
Lord Cardinal, if thou think'st on Heaven's bliss,
Hold up thy hand, make signal of thy hope.— [*Pause.*]
He dies and makes no sign; O God forgive him!
War. So bad a death argues a monstrous life.
King Henry. Forbear to judge, for we are sinners all.
Close up his eyes, and draw the curtains close;
And let us all to meditation.

Henry VI.-act iii. sc. 3.

The Rev. H. H. Higgins took the natural view of Shakspere's defects, as resembling those which were found in the works of other great men. They must be content to see something of inconsistency in those whom they most ardently admired. He could not but think that there were blemishes in Shakspere, in the shape of yielding too much to the prevailing taste of the times; but there was also an undercurrent of high and even religious feeling, something more than mere natural religion—something higher and truer—something of the religion that had come from heaven itself—that imbued a large portion of his works, and was not less true because not obtrusively placed before the reader.

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EIGHTH ORDINARY MEETING.

ROYAL INSTITUTION, 8th February, 1858.

DR. INMAN, PRESIDENT, in the Chair.

The following gentlemen were elected Ordinary Members:—

Mr. WILLIAM KEITH.

„ JABEZ JONES.

Mr. ANDREW communicated some personal observations on the recent eruption of Vesuvius, in support of the chymical theory of volcanic action.

In consequence of a public meeting, held in the same building, for the formation of the Liverpool Society of Fine Arts, on the motion of Dr. IHNE, the Society adjourned till the 15th inst.

On that night a paper was read to the Society, of which the following is an abstract:—

ON INTERNATIONAL ARBITRATION.

BY WILLIAM IHNE, ESQ., PH.D., V.P.

THE rapid development of the means of intercommunication has changed the relations of the nations of the world to such an extent, that the old forms of diplomatic intercourse between one people and another are no longer sufficient. Europe is fast tending to become commercially, economically, intellectually, and morally one uniform community which requires a system of law and government based upon generally acknowledged principles, and administered by a generally acknowledged authority; not to absorb or obliterate the individual notionalities, but to regulate and facilitate their intercourse and to

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settle the differences which must necessarily result from the wonderful activity of that intercourse. Treaties for special purposes, congresses for the settlement of occasional disputes must give way to general laws and some permanent authority. What has been accomplished to a certain extent by the several systems of confederation among different branches of the Teutonic stock, must be perfected and extended all over the world.

The greatest difficulty lies in the inequality of the different states. It would be absurd to organize a federal authority in which a powerful state like England, or Russia, should have no more influence than Sweden, or Belgium. A certain scale must be fixed upon analagous to the real strength of each state. England, France, Russia, Austria, and America, might rank equally high; states like Prussia and Turkey in the second line; Spain, Sweden, Naples, Sardinia, in the third, and so on; and the number of votes of each state should be regulated so as to ensure an equitable balance of influence. Mathematical precision is unattainable, but a workable approximation to the real nature of things may be hoped for.

A permanent court, composed of ambassadors of all states who voluntarily join such a confederation should regulate all international relations, subject, in the last instance, to the consent of the legislature of each state.

In cases of differences or dispute, the court should give its decision on the question of right. The moral force would be great, and in all but extreme cases sufficient to ensure compliance. The appeal to force would become less and less frequent; and though it would perhaps be impossible to organize an international executive, the confederated powers would stand pledged to see the decision of the court carried out.

The effect would not be the immediate abolition of all wars, but a prevention of the frequent collisions and

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hostile attitudes of nations against nations; minor disputes would not so easily grow into serious conflicts, and diplomatic considerations would be infused with some considerations of justice. It would not be derogatory to the most powerful state to submit to the decision of such a court. The feeling of security would promote the feeling of friendship and goodwill; the energies of all nations would be more and more diverted into the channels of useful industry, and directed to further the grand interests common to all.

The scheme can be considered chimerical only, when in its totality and completeness it is compared with the present unsettled state of international affairs. But it is quite possible to lay a foundation to such an international court, which might by degrees be developed. If a few of the leading states came to an understanding, many would shortly follow, and we might hope to see the beginning of a new era in the history of Europe and the world in which thinking men would look upon the wars of France and England with the same feelings of regret and pity as we do now on those waged for many generations between England and Scotland.

NINTH ORDINARY MEETING.

ROYAL INSTITUTION, 22nd February, 1858.

DR. INMAN, PRESIDENT, in the Chair.

Mr. ROBERT LITTLE was elected an Ordinary Member.

RICHARD BROOKE, Esq., F.S.A., exhibited the first report

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of The Liverpool Dispensary, published in the year 1799, and made observations on the list of subscribers.

Papers were then read,

"On Preserved Milks and Meats," by C. Bell, Esq. in which that gentleman resumed the consideration of the important scientific and practical question of encasing various articles of food, so that they might be kept in a fresh and nutritious condition for a number of years. He opened, in illustration, several canisters of milk, chocolate, eggs, and mutton, all of which were in excellent preservation. [See page 65.]

"On a New Method of Manufacturing Steel, by William Clay, Esq.

Before describing his process of making cheap steel, Mr. Clay referred to that of manufacturing iron; the ore being first taken from the blast furnace in the form of "pig-iron," which was a composition of carbon and that metal, and then refined by the puddling operations, by which the carbon to a certain degree was removed and "wrought iron" produced. To obtain steel a further series of operations had to be gone through, carbon being again united to the iron, but not in the original proportions of the pig-iron. His object was to remove from the pig-iron such a portion of carbon as would give it the composition of steel, and the difficulty lay in removing the necessary quantity. A plan for doing this had been patented in 1850, an excellent wrought steel being produced.

Mr. Clay then explained his method of producing puddled steel, and exhibited numerous specimens which illustrated its strength, fracture, homogeneousness and power to receive in the lathe a very high polish. He considered it a metal exceedingly well adapted, from its

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lightness, strength, and cheapness, for ship-building purposes, and the permanent way and rolling stock of railways.

TENTH ORDINARY MEETING.

ROYAL INSTITUTION, 8th March, 1858.

The REV. H. H. HIGGINS, M.A., Sen. V.P., in the Chair.

Attention was drawn to the approaching Solar Eclipse, and the arrangements which had been made for members going on to the central line of eclipse, on the Saturday prior to the event.

The following paper was then read:—

ON THE INFLUENCE OF CHRISTIANITY ON THE ROMAN MATRIMONIAL LAW.

BY CARL RETSLAG, PH.D. BERLIN;
PROFESSOR IN QUEEN'S COLLEGE, LIVERPOOL.

CHAPTER I.

THE Eastern world of antiquity, with all the wonderful productions of its fancy, startles us by its strangeness. We must strain our mind and force our imagination in order to understand its ideas, works, and actions. The Greek life lies already nearer to us, its arts and literature already seem to have proceeded from a spirit which is more related to ours. We recognise in the public transactions of that nation the sympathies and passions of our own world. But even Greece, if we look deeper into her private life, has still enough which is strange to us,

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and which tastes of its Eastern origin. The rights of the individual are still submerged in the laws and customs of the state or community. That division within the individual man—how far he belongs to society, and how far he is his own empire—a division which forms the fundamental law of modern humanity, was still unknown in Greece. The wisest legislation amongst the Greeks, which approaches the nearest to our ideas,—that of Solon—still encroaches in many parts on the autonomy of the moral man. Religion, morals, and civil rights are still unseparated. Therefore if Greece raised in the fine arts the standard of taste, she was unable to lay down rules for the civil intercourse of man with man. The attempts which were made in Sparta, and even Athens, to regulate this intercourse, excite by no means in us the admiration which we are obliged to pay to their architecture and sculpture; nay, their jurisprudence often startles us, as no less strange than the Pyramids of Egypt. According to tradition, the Romans have fetched their laws of the Twelve Tables from Greece; but Gibbon says justly, that, "in all the great lines of public and private jurisprudence the legislators of Rome and Athens appear to be strangers, or adverse to each other;" an opinion with which even the Greek Dionysius Halicarnassensis so far agrees, that he owns the superiority of the Roman law. The legislation of Lycurgus, Dracon, and Solon, says Cicero, appear "*inconditum ac pœne ridiculum*," in comparison with the Twelve Tables.

If we had to fix with one word the place which we would accord to Rome in the history of civilization, we should say it was Rome who first separated civil law from religion and morality, and abolished therewith a confusion in the relations of man, which retarded so much the progress of his civilization. Rome was the first state that freed the civil man from the fetters of

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religious and moral precepts, and assigned to religion and morality the inner man. By this separation religion and morality gained as much as it was now possible, to place the civil relations of man upon a reasonable, truly humane basis.

The greatest glory and the boldest step of the Romans, in the history of civilization, is their jurisprudence. The fine arts of Rome, her architecture, sculpture, literature, are only more or less successful imitations of Greece; her conquests are destroyed, her roads and aqueducts lie in dust and ruins, but the principles which she has laid down for the *meum* and *tuum*, and for the regulation of the family, live still, and will live as long as the world abhors the maxims of communism. "The vain titles of the victories of Justinian are crumbled into dust, but the name of the legislator is inscribed on a fair and everlasting monument," says Gibbon.

The Romans were no deep philosophers. Their ideas about the nature of the Deity and her relations to man are superficial reflections, or pale copies of Greek speculation; but their mind was peculiarly adapted to penetrate the entangled relations of the practical world. Their views were more minute than elevated. This power of their mind fitted them above all former nations to regulate the social world in its material transactions. Rome was thus destined, if I dare say so, to complete Christianity. What Christianity has done for the inner man, Rome did for the outer man. Nay, we are almost inclined to say, Rome, the heathen Rome, christianized the relations of man to man, as far as these relations do not belong to the purely moral and religious world. The three "*præcepta juris*" of heathen *Rome*, "*honeste vivere, alterum non lædere, suum cuique tribuere*," waited only for the addition of the great Christian precept, "love your neighbour as yourself," to complete the great fundamental

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laws for the relation of man towards man in his moral as well as social bearing.

When the Roman Emperors adopted Christianity and raised it to the state-religion of Rome, the new religious mistress found a world, which in morals formed the very counterpart to its own precepts, but if she looked beyond the province of morality into the business of the social world, she met very little that was opposed to her views, or that she could not adopt as proceeded from her own spirit, unless we consider the communism of the first Christian societies as an essential Christian institution. It was a Christian Emperor who, after the spirit of Christianity had already developed itself for upwards of five hundred years in its bearing upon the practical world, could do no better, in order to establish the principles of justice in harmony with Christianity, than to adopt "*In nomine domini nostri Jesu Christi*" as the procenium to the code of Justinian says, the same laws by which heathen Rome was governed, and Christian bishops and fathers of the church, decrying the philosophy and literature of the heathen Greeks and Romans, acknowledge gladly the wisdom and justice of a Papinian, Ulpian, Paulus, or Gajus.

But the laws of heathen Rome, as they were adopted and sanctioned by the Christian Emperor Justinian, were the result of a gradual development, in which a great many internal and external powers and influences were at work ever since the first laws of Romulus and Numa Pompilius. We cannot, therefore, agree with Gibbon, who says:—"During four centuries, from Hadrian to Justinian, the public and private jurisprudence was moulded by the will of the sovereign; and few institutions, either human or divine, were permitted to stand on their former basis." To be sure, the maxims of the Roman jurisprudence received in the second and third centuries after Christ, especially under the Emperors

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Hadrian, the Antonines, and Alexander Severus that final form, in which they were adopted by Justinian; but these maxims were neither moulded by the will of the Emperors, nor had they an altogether different basis from those before Hadrian. The private jurisprudence at least has grown by gradual development, which now and then assumes the aspect of a more visible change, as in the Twelve Tables, and at the end of the republic.

Almost all the great nations of antiquity commenced their public career by a great strictness of morals, and severity and ceremoniousness of manners, so the Persians, the Egyptians, and amongst the Greeks, especially the Spartans. Thus when Rome was but a small community, whose existence and independence depended upon unity; and when this unity amongst at least three different tribes could only be enforced by strict laws, these laws assumed a peculiar Roman and narrow character, and were surrounded by national prejudices and religious ceremonies. When a new nationality is forming in the history of mankind, the people are naturally full of prejudices and views, which distinguish this new nation from her surrounding neighbours. Upon the strength of these prejudices the national courage and the national pride seem to rest. Every marked nationality has thus, especially at the beginning of its life, marked prejudices, and the smaller this nationality is, the more it will lock itself up against foreign influence, and the more one-sided and narrow-minded its institutions will be. The first laws of Rome, as comprehended in her *jus sacrum*, are full of stiff, ceremonious, and superstitious forms. As in the East, and as in Greece, religious superstitions pervaded the whole law, and brought the civil justice under the rule of priests and augurs. But when Rome was enlarged by conquests, and the town itself grew by the influx of foreigners, the stiff forms of the ancient laws

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became daily more inconvenient and unfit for the more complicated affairs. Then arose at the side of the old law a new one with more liberal principles, and the whole juridical world was divided into two. The *jus honorarium* was then created, and the principles of the *jus gentium* gained daily more ground from the stiff and ceremonious *jus civile*. This division goes through all the branches of the law, and established especially two almost antagonistic principles for the two great pillars of society—property and family. At the side of a *quiritian* property a *bonitarian* property arose, and the old marriage by *confarreatio*, with its *manus* and *patria potestas*, was opposed by more liberal forms of matrimony. Whether these two principles, the struggle of which formed the history of the Roman laws down to Justinian, germinated already in the composition of the Roman community, so that the Sabinians introduced the grave, ceremonious, and religious element, and the livelier Latins brought the liberal, progressing, and rational part with themselves; or whether the enlargement of the town and the immigration of foreigners alone originated the liberal principles, which are already visible in the earliest days of Rome, is now impossible to decide. Both these powers were very likely at work to free Roman jurisprudence from all narrow national forms, and make it the foundation of the jurisprudence of the world. The more wrong Gibbon is, when he ascribes the change in the foundation of the Roman private law to the will of some Emperors. The public law was, of course, changed and moulded by the will of the Emperors, who placed gradually despotic institutions on the ruins of the republic; but this change was already, though cautiously, commenced by Augustus. The private jurisprudence, on the contrary, underwent a gradual development, especially since the Twelve Tables down to the great Justinian code; and whatever change

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took place, this change was certainly not brought about by the mere arbitrary will of the Emperors, but by the equity of the Prætors and the wisdom of the Jurisprudentes.

In the first period of Roman jurisprudence public law entirely ruled the private. This public law, as *jus sacrum*, still bore the religious and moral character, by which all the eastern nations, and even Greece, confounded religion, law, and morality. The Twelve Tables were the first attempt to give to private law an independent position, and free it from the fetters of the *jus sacrum*. The political history of Rome goes, of course, hand in hand with her legal history. By the increase of political power, which the plebeians obtained gradually through the increase of their number by the enlargement of the town, the *jus gentium* pushed the narrow and inconvenient *jus civile* out of many legal relations. It was the *jus honorarium*, that is to say, the power of the Prætors, which first wrought a fundamental change in the principles of the private law. The Prætor protected, as far as his power went, the Roman citizen from the rigorous consequences of the civil law, and prevented the realization of the maxim "*fiat justitia, pereat mundus.*" But amongst all sources from which Roman private jurisprudence derived its life and its greatness, the "*interpretatio prudentum*" is the most important; and if we have to point out one source as pre-eminent, we cannot but say, that not the will of the Emperors, but the wisdom of the great lawyers has moulded the private jurisprudence of Rome. One glance at the great Justinian collection will convince us how far more important the sentences of Papinian, Ulpian, Paulus, Gajus, Modestinus, &c., have been than all the constitutions of the Emperors.

Nothing shews so much the spirit by which the gradual development of the Roman laws was animated as the

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change in the matrimonial conditions. Nowhere is the liberalising influence of the *jus gentium* clearer than in the way in which it gradually abolished the old religious marriage by *confarreatio*, and brought about, what modern lawyers are accustomed to call the looseness in entering upon matrimony which distinguished the latter periods of the Roman empire.

Matrimony is decidedly religious in its essential character; it is a condition which lies beyond the frontiers of civil society. This the Roman lawyers felt well, when they said that "*maris et feminæ conjugatio, quam nos matrimonium appellamus*," descends from the "*jus naturale*, and the definition which the heathen lawyer, Modestinus, gives of marriage, has scarcely been surpassed in delicacy of feelings by any mediæval church-father or modern divine and philosopher. "*Nuptiæ*, he says, *sunt conjunctio maris et feminæ, et consortium omnis vitæ, divini et humani juris communicatio.*" When matrimony is thus a merely religious condition in its essential point, it has on the other side external relations which belong to the province of civil society. These external relations of matrimony fall under the jurisdiction of the civil law. Matrimony thus becomes in the same time a civil institution, whilst its roots, as is poetically said, lie in heaven. These external relations civil law must regulate according to the sacred character of matrimony itself, but only these external relations; and it has to take care that none of its regulations and orders touch this sacred character itself.

It has been in modern times a matter of dispute, whether the conclusion of a marriage ought to be a mere civil act, or whether the stamp of religion is necessary for its completion. The general, deep-rooted feeling of mankind manifests a decided favour of religious participation, if not sanction; it shews that an internal though indistinct conviction is alive in man, that the true

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character in married life is religious and not political, and belongs to a higher world than the business of civil society.

Amogst all the nations who have a national religion the conclusion of a marriage is one of the most solemn religious acts; and I think there are few primitive and uncivilized nations who do not surround a wedding with a variety of religious ceremonies. Amongst the Greeks the betrothed sacrificed to Hymen. In the first days of Rome, when religion ruled all the civil relations of man, the conclusion of a marriage was solemnized with the the greatest religious awe, though we are now-a-days not able to understand the solemnity of the scene. Whilst the priest was performing the sacrifice the bride and bridegroom were sitting upon sheepskins and eating salt-cakes. Yet Plinius says of this singular form of marriage, which was called *confarreatio*: "*in sacris nihil religiosius confarreationis vinculo erat.*" This marriage, concluded in presence of ten witnesses, could not be dissolved, for the so-called *diffareatio* was no divorce. Though the moral foundation of the *confarreatio* was like the Christian idea of matrimony as developed in the catholic church, and fixed by the Council of Trent, its political consequences breathe still the spirit of eastern patriarchal despotism. The two principal effects of the *confarreatio* were the *manus* and the *patria potestas*. The authority which the *manus* gave to the husband over his wife, was almost without limits. If the law seemed to presume that the exercise of this authority would be tempered by conjugal affection, *maritalis affectio*, which was considered as the necessary condition of matrimony it forgot that law has to provide for the weakness and perversity of man. The *manus* was a terrible instrument in the hands of a brutal husband which he could use short of the very murder of his wife. In this

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only he was restricted by a family council, which decided over life and death of the unfortunate female. The Roman historians relate several examples of such family-courts, especially Livius, lib. xxxix. cap. 18., in the affairs of the Bachanalia. That the wife had no property of her own was a matter of course in such a slavery. Still more oppressive for the children was the unbounded power of the *patria potestas;* even murder was not excepted from the rights of the father over his children. The *patria potestas* was the more inconvenient for the son, as not his coming of age or getting married, but only the death of the father or emancipation, could deliver him from it. The *peculium castrense* was the only exception from the power of a father whose son gained property as a soldier in the field.

However, I have already mentioned, that in the earliest institutions of Rome two principles are visible, the struggle of which might be traced through the whole history of the Roman law up to Justinian. Thus the *confarreatio* seemed to have been restricted to the patricians already in the earliest times, and to have belonged to that *jus sacrum* which the patricians considered as the peculiar law of their caste. Whether this ceremony is of Sabine or Latin origin is of little importance to us, yet I think there can be little doubt that it is by far more in accordance with the spirit of the Sabinian laws, than with that of the livelier and more soldier-like Latins. The Plebeian families, who settled in Rome, belonging to other tribes, had certainly different religious rites, and could not adopt a ceremony which had for them no meaning and no religious solemnity. People generally are in nothing more particular than in adopting a ceremony which differs in the slightest from their accustomed rites. We might more easily impose upon them a new doctrine than a new ceremony. Yet it is not

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likely that the Plebeians married without any forms, political or religious; and that at the side of so much grave ceremoniousness of the Patricians the utter lawlessness should have existed amongst the other orders, as we are accustomed to read in the legal histories of Rome. I am inclined to believe that different forms of marriage, or rather different ceremonies in concluding a marriage, have existed amongst the early Plebeians of Rome, which they brought with them from their former homes.

The whole internal history of Rome shews us the importance in which the family was held, and how her political institutions were based upon the *gens* and *familia*, so that it is impossible to believe that marriages were entered upon in Rome in such a loose and formless way, in which it is so often represented. The lawyers who studied the legal and social history of Rome, observed that there was no law which fixed any certain form for entering upon a married life, and they drew the conclusion, that the marriages were therefore devoid of every form. But we find traces enough in the Roman social history that there existed many forms, yet that these forms, descended perhaps from different tribes who immigrated into Rome, lived on rather as customs than as laws. The state, after the old religion had lost its power over the legislation, did not venture to touch and to fix legal forms for an institution which it considered as not properly belonging to the province of law; but it recognised matrimony whenever it saw that a man and a woman had the intention to live as husband and wife.

The *maritalis affectio* was the principle by which it distinguished matrimony from the other connections of man and woman. Under whatever forms this *maritalis affectio* was to be declared, the state left to the consciences of the individuals or to time-honoured customs.

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A strict matrimony, as it is called, was then in earlier times, we are told, concluded by the Plebeians in two ways, of which at least the first was not denuded of all solemnities—by *coemptio* and *usus*. The *coemptio* was a kind of sale in presence of five persons, who were to be Roman citizens and of age. The *coemptio* seems originally to have formed a part of the *confarreatio*, and to have become an independent ceremony through King Servius, whose endeavour it was to set aside the old religious forms of the law, and to replace them by monetary transactions. By the *coemptio* the wife became *mater-familias*. The civil effects of such a marriage were the same as those of the *confarreatio*, as far as regards the *manus* and the *patria potestas*; the difference was, that a marriage by *coemptio* could be dissolved. The third, the most unceremonious way of getting married, was that by *usus*. By *usus* the man acquired his wife, so to say, by prescription. If a woman went to the house of a man and lived there with him for a full year, the man acquired the rights of a husband over her, especially the *manus*; but it is understood that she came to him and he received her with conjugal affection. It was a principal feature in the strict matrimony—and the other matrimony, the *matrimonium juris gentium*, was not known in the earliest days of Rome—that the wife was held in *tutela* by the husband. She had no civil rights, no property; she was in fact, like the *filia-familias*, a part of the family under the unrestricted dominion of the husband, subjected to any treatment or punishment he liked to inflict upon her, capital punishment excepted. A family was an empire in itself, in which the *pater-familias* was the despot, and might be the tyrant, secluded from any interference of the state. A woman who came once *in manum* of a Roman husband, had no other weapons to defend her rights as a human being than those female arms, by means of which she

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still conquers to-day the wildest man. If those arms failed, she not seldom revenged outraged humanity by poison. The position which the woman had in the early days of Rome, was still the eastern slavery; but it was reserved for Rome to raise the woman to a condition in which she could be an independent companion of the man, if not his equal.

The slavery to which the *manus* condemned the Roman wives, could not last long amongst the high-spirited Roman ladies; and though the husbands were the legislators, the home-influence upon these became soon visible in the way in which that terrible power was first restricted by law, and afterwards abolished by custom. The Twelve Tables ordered already that, when the year in which a woman had lived with a man was interrupted by an absence of three nights, the prescription was interrupted, and the man did not acquire the *manus*.

An element which contributed powerfully to the introduction of liberal principles in the Roman jurisdiction in general, as particularly in the matrimonial law, was the great caste and national pride of the early Romans. The haughtiness of the Patricians could not bear to share the same laws with the Plebeians; and the Roman citizens in general, whether Patricians or Plebeians, scorned to allow the foreign new comers to participate in their *jus civile*. The spirit which the Romans shewed, thus in allowing the foreign immigrants, or the subjected nations, to preserve as much as possible their own laws and customs, is less the result of liberality than of narrow-mindedness. The introduction of a *jus gentium* in Rome, is due to this Roman haughtiness. It then so happened, that this *jus gentium* gained more and more ground, not only in transactions of the *peregrini*, and of the *peregrini* with Romans, but amongst the Roman citizens themselves. This *jus gentium*, based upon a broader, more liberal, and rational

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basis, first influenced and at last almost overthrew the *jus civile*. It was by the influence of this *jus* that the history of Roman jurisprudence manifested the general tendency to release the laws from narrow and oppressive forms, and to establish them on principles which are founded on so broad a basis that they, long after the downfall of Rome, could be adopted by almost all nations and all ages. A constant march is visible towards legal conditions, which, unrestricted by national prejudices, rest upon the broad foundations of human justice and reason.

The spirit of Christianity releases the woman from the slavery in which she was held in the east, and even in Greece, and places her at the side of the man, as his companion and his equal. The Roman law declares that the wife is the consort of the whole life of the husband, and shares all his divine and human rights. Was Modestinus, who gave that definition of matrimony, influenced by the spirit of Christianity which was then active, though not dominant, in different provinces of the Roman Empire; or is it that the development of the Roman world led naturally to principles which are so much in accordance with Christianity?

It is a singular coincidence, that whilst in the east the followers of Christ propagated the religious and moral doctrines which were to rule the future world, the Roman lawyers brought to a final form the great principles of justice, by which the greatest number of the Christian nations should be governed. And yet these very same lawyers were all animated by a great hostility towards the new religion.

The *matrimonium juris gentium*, or the free matrimony without the *manus*, began about the time of the Twelve Tables. This matrimony took at first only place with intermarriages between foreigners and Romans; but as it was free from the inconvenient regulations of the *manus*,

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the Roman ladies preferred, of course, this new marriage to the old form, which subjected them to such a slavery; and as the ladies, if not afterwards, exercise, at least as brides, a paramount influence over the gentlemen, the free marriage gained, by degrees, ground even with marriages amongst Roman citizens, the more so, as the husband too had the advantage of easily getting rid of a wife of whom he had got tired. If we are on the one side astonished, that after the old religious ceremonies had disappeared, no new forms were fixed by law for an institution which was of such wide civil consequences, we must not forget that there were in Rome already, and much more in the wide-spread Roman provinces, many customs which were preserved down to the latest times of the Roman empire, and that the law, whenever a question about a marriage was mooted, acknowledged these customs as manifestations of the *maritalis affectio*. As there existed in Rome, besides the *matrimonium*, the *concubinatus* and the *contubernium*, two institutions legalized by the state, which might have been confounded, but which had far different civil effects, for instance, for the rang of the children and the condition of inheritance, it was necessary to fix a principle by which the *legitimate* marriage was recognised. This principle was not an external judicial form, but an internal, moral condition. Ulpian says, "*non enim coitus matrimonium facit, sed maritalis affectio.* Whenever this *maritalis affectio* was manifested, as we mentioned already before, and by what ceremonious forms or customs it was manifested, according to the conscience or will of the contracting parties, the Roman law acknowledged matrimony. The legal prejudice was so much in favour of the *matrimonium* that, whenever two persons of different sex lived together, who were both not slaves, the law presumed the *maritalis affectio*, and treated the alliance as a legal matrimony

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But amongst the many forms, in entering married life, which have existed in the Roman empire down to the latest times, we recognise especially the following.

The conjugal affection which arises between two persons of different sex, manifests itself first in the *consense* of the parties to live as husband and wife. "*Sponsalia, sicut nuptiæ, consensu contrahentium fiunt,*" was the rule pronounced by Julian, and adopted by Justinian in the Pandects. This *consense* was generally first declared by the betrothal, *Sponsalia*, which were still in use* in that part of Italy, which is called Latium, as Aulus Gellius quotes from a work of Servius Sulpicius *de dotibus*. In these *Sponsalibus* the *sponsus* promised that he would marry the woman, and the father, or whoever had the power over the woman, promised that he would give the *sponsa* in marriage; and a fine could be imposed by the judge upon him who broke off the engagement without *justa causa*. This fine was abolished in later years, till an *arrha*, a kind of earnest money, was given at the *sponsalibus*, which the party lost that broke off the engagement.

Another way of recognising a *legitimate* marriage was offered by the transactions of the *dos*, which preceded the marriage.

In some instances we find that a declaration of the contracting parties before witnesses, that the union upon which they entered was a real matrimony, and not a *concubinatus*, was necessary. So the *lex Delia Sentia* orders, that if a liberated slave, who cannot get the *civitas* on account of not being thirty years of age, marries a *civis Romana* or a *Latina*, declares this marriage before seven Roman citizens who are of age, and gets then a child, and this child is a year old, he can demand from the Prætor to

* About 90 before Christ.

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give to him, his wife and the child, the rights of Roman citizens.

The *deductio in domum* is often considered as a necessary ceremony for commencing matrimony; but though it seems to have been a usual ceremony, as well as the declaration before friends, *inter amicos*, it was by no means necessary for the legal completion of the marriage, yet it was another act by which a legitimate matrimony was proved, and from which it was counted in point of time.

The lawyer Scævola, who lived under Marcus Aurelius, says, in a quotation in the Pandects, in speaking about a donation, whether it was made after or before the marriage, "*priusquam ad eum transiret* (that is to say, the *virgo) et priusquam aqua et igni acciperetur, id est, nuptiæ celebrentur*" (Dig. xxiv. tit. i.), it seems, therefore, that the ceremony of giving water and fire, the two principle elements as a sign for the "*consortium omnis vitæ*" was still in use in the latter part of the second century after Christ, and formed, together with the "*deductio in domum*," the general way of entering married life. The receiving of water and fire played formerly a part in the religious ceremony of the *confarreatio;* but this *confarreatio* was no longer customary at the time of Augustus, except with the marriage of some *flamines*, some of the highest priests.

The Romans, or rather the inhabitants of the Roman empire, therefore, it is certain, did not even in the latest ante-Christian era, enter generally so unceremoniously upon the bond of marriage; for even some religious rites were preserved amongst the heathen subjects of Rome as late as the time of Marcus Aurelius, when already Christianity began to spread her communities in the eastern parts of the Roman empire. It might be supposed that, when Constantine planted Christianity upon the throne of the Cæsars, this new religion would have had nothing more eagerly to do than to change entirely

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an institution which is so closely connected with religion. We might fancy that it would have been the first business of the Christian bishops to urge on the civil government the necessity of submitting matrimony to the regulations of the church. But though several of the first Christian emperors issued unimportant changes in the laws about the relationship of the married parties, none thought of introducing a fixed form for the marriage. Justinian, though he pronounced matrimony to be a mere civil contract, was the first who attempted to connect it legally with the church.

In a novel of the year 538 he ordered that all persons belonging to the rank of a senator, or who could claim the title "*illustres*" and upwards, should make written *pacta dotalia* when concluding a marriage; persons of less rank, though not belonging to the lowest classes, should go into an oratory and declare there, before the "*defensor ecclesiæ*," a kind of churchwarden, in presence of three or four ecclesiastics, their intention to marry. But so strong was in the Roman empire the idea that the wedding was a mere private affair, with which public powers should not meddle, that already, four years afterwards, Justinian abolished again this order, as far as it concerns the church, and only preserved the necessity of the written *pacta dotalia* for the highest classes. This apparently strange phenomenon is easily explained by the internal condition of the Christian church itself. The Church of Christ was still satisfied with the internal approbation and the faith of man, and had not grown into a church which appeared in the same time as a worldly institution, adorned with worldly power and worldly glory. The church of these ages had her dominion rather in the voluntary and hearty submission of man, than in the splendour of her ceremonies and the terrestial power of her bishops. It had always been the custom, in the first Christian

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communities whose every-day actions were, to say, so saturated with religious feelings that no betrothal took place without the concurrence and sanction of the elders. That this ecclesiastic or rather religious concurrence took place more at the betrothal than at the wedding itself, is a fact which manifests the conviction that the real union of the persons commenced with their mutual *consense* to belong to each other, and that the marriage, in a mere religious point of view, is completed by that *consense*. With this view, the contemporary heathen world of Rome entirely agreed, as we have shewn. That which was an internal religious want in the earlier times of Christianity, became a habit in the later ages. Every betrothal was then regularly announced to the Christian clergy, and every marriage blessed by them. This explains the absence of any law, civil or ecclesiastic, that commanded the sanction of religion for the marriage for some time after Justinian, as the bishops had no need to enforce by laws what was voluntarily and heartily given to them; and the civil authorities were too much accustomed to consider matrimony as a mere private contract, based upon conditions which lie beyond the civil power. When, after a further development of the worldly organization of the church, marriage and its relations came under the ecclesiastic jurisdiction, a far greater importance was still laid upon the publication of the bann and the consecration of the betrothed, than upon the wedding itself. If I am not mistaken, it is first in the wedding-liturgies of the fifteenth century that we read the words "*ego vos conjugo in matrimonium in nomine Dei*," when the priest performed the proper act of copulation as proxy of God, a long time after matrimony had been considered as a sacrament in the church, though it was only legally raised to that dignity in the Council of Trent.

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ELEVENTH ORDINARY MEETING.

Royal Institution, 22nd March, 1858.

The Rev. H. Higgins, M.A., Sen. V.P., in the Chair.

Professor Archer referred to recent valuable gifts to the library of the Royal Institution.

Mr. Higginson exhibited a specimen of aluminum, and referred to the process of its manufacture.

The following paper was then read:—

ON THE FOSSILS OF PERIM ISLAND, IN THE GULF OF CAMBAY.

By HENRY DUCKWORTH, Esq., F.G.S.

Perim is a small island in the Gulf of Cambay, ten miles S.S.E. of Gogo, in lat. 21° 33′ N., and long. 72° 28′ E. It is one and a half to two miles in length, and a half to three quarters of a mile in breadth. The most elevated point is about sixty feet above high-water mark.

From the Kattiawar shores it is separated by a channel five hundred feet in width, and seventy-five fathoms deep. The average depth of the Gulf to the north and elsewhere, is about fifty-five fathoms. There is a tradition current among the inhabitants of Gogo that Perim was originally united to the main land by means of a stone bridge. This would seem hardly probable, if we take into consideration the width and depth of the intervening channel at the present day; though certainly there are appearances which, independently of the geological evidence hereafter to be adduced, and which I think conclusive, would justify the supposition that at some very distant period there may have been a natural,

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if not an artificial, connection. The beach on the western side shelves very gradually, and at the lowest ebb of spring tides the island appears as if separated from the continent by a mere stream only. That the sea, too, has been encroaching on all sides, is proved, I think, by the fact that on the shore have been discovered two figures of elephants, eight or nine feet in height, carved out of the solid rock, and which, except at the very lowest tides, are completely covered. There are also remains of a stone structure running out into the sea, and somewhat resembling a pier; but whether they have any connection with the apparently mythical bridge, it is impossible to say.

The island is inhabited by four or five lascars, and a few coolies; the former have charge of the light-house, which stands on the highest ground, on the western side; the latter live in a valley on the eastern coast, open to the sea, and the only fertile spot: here they have formed a settlement, and plant grain during the monsoon, and manage, somehow or other, to exist in this dreary land. Good fresh water is found about twenty feet below the surface.

The only other living creatures besides human beings, are, I think, peafowl, which abound, and are wonderfully tame and fearless: no man's hand is against them, for they are deities. To kill a peacock were sacrilege—not a breach of the game-laws.

The low muddy beach on the northern end is covered with clumps of the melancholy mangrove tree; the opposite coast of Kattiawar I observed to be also fringed with it. Remains of a temple with an image of Buddha in it, a ruined fort and water tanks are to be seen, from which it would appear that the island had been a considerable stronghold some twelve or thirteen centuries ago.

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GEOLOGY OF PERIM.

The various sandstones, clays, and conglomerates of which Perim is composed, are to be referred to the Miocene period of the Tertiary epoch. They are identical in general character with the ossiferous beds of the Siválik hills or Sub-Himmalayan range, with those of Attock, on the banks of the Indus in the Punjab, and with the Irrawaddi beds in Ava. We find their equivalents in the Red Crag of Suffolk, in England; in the Faluns of Touraine; the Orleannais and Sub-Pyrenees in France; the Vienna Basin on the Danube; and Eppelsheim on the Rhine.

Major Fulljames, who seems thoroughly to have explored the island some twenty years ago, was the first to classify its various strata, and he has made them out thus,* commencing from the surface:—

1. Loose sand and earth.
2. Conglomerate, composed of sandstone, clay, and silex.
3. Yellow clay.
4. Conglomerate.
5. Calcareo, silicious sandstone, with a few fossils.
6. Conglomerate.
7. Indurated clay.
8. Conglomerate, the principal ossiferous bed.

It is curious to observe how the conglomerates occur alternately with the other strata. The deepest beds of conglomerate are about three feet, but they do not run more than eighteen inches to two feet, and for the most part lie horizontally. The strata on the western side are much disturbed, being fractured, and dipping at an acute angle to the east. On the southern end of the island,

* "Journal Asiatic Society of Bengal," vol v. page 289.

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below the stratum in which the fossils occur, sandstone appears, dipping to the north at an angle of 25°.

Through the decomposition of these rocks, dunes, or sandhills, covering the whole island, appear to have been formed. They are for the most part of very peculiar shape and aspect. Dr. Lush seems to think that they have proved a barrier to the further encroachment of the sea.*

The lowest beds of conglomerate are composed of nodules of sandstone, indurated clay, and a small proportion of silex, cemented together with a yellow clay. On the western side of the island it is entirely denuded through the action of the sea, and it can, therefore, be examined narrowly. The fossils and nodules imbedded in this formation are constantly being washed out of the matrix, and consequently are to be found lying loose in the thick beds of mud and silt, exposed to view when the tide is out. These nodules, rolled by the waves, have been worn into the most strange and fantastic shapes. The fossil remains, through the same cause, suffer severely, and this accounts for the very few perfect and clear specimens that have hitherto been discovered.

We should naturally expect, that if Perim was ever united to the main land in past ages, we should be able to detect its clays, sandstones, conglomerates, and bone beds on the opposite shores of Kattiawar—and such is the case; and this is the evidence to which I referred at the beginning of this paper, as being so strong in favour of the idea that such a connection did once exist. Major Fulljames† found that similar formations lay along the whole line of coast from Gogo to Gossnath Point; and in the conglomerates discovered fossils of the same age

* Dr. Lush, "Journal of the Asiatic Society of Bengal," vol. v. p. 767.

† "Journal of the Asiatic Society," Bengal, vol. vi. p. 787.

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and character as those of Perim. (I may mention that at Gossnath Point the fine sandstone is quarried, of which the magnificent Jaina temples at Palitána are constructed.)

The separation may have taken place either through the action of the sea, which is unusually severe in the Gulf of Cambay, or else under the influence of one of those terrific earthquakes so frequent in that region. Major Fulljames, in the same notice in which he communicates the discoveries above referred to, concludes by saying—"This fact ascertained (*i.e.* that the formations of Perim and the main land are identical in appearance and general character), settles the question of whether Perim was originally a part of the continent, and it only remains to prove how the separation has taken place. My opinion is, that it has been effected by the force of the current during the ebb tides and the swell of the monsoon."

DISCOVERY OF FOSSILS IN PERIM.

Dr. Lush was the first to discover that fossils existed in Perim Island. He mentions the fact in a short account of the geology of the Northern Konkan, which appeared in the *Journal of the Bengal Asiatic Society*, in 1836; at the same time he seems to have been ignorant of the true nature and value of his discoveries, as appears from the following letter from Baron Hügel, of Bombay, communicated to the same Journal. Addressing the secretary, he says—

"You will receive shortly a few fossil bones from Perim Island, in the Cambay Gulf—Dr. Lush has the merit to have found them, but without exploring them at all. I had no time to go over from Surat where Dr. Lush shewed me them. I requested him to send them to you through Mr. Walker. One is an imperfect bone of a Mastodon

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or elephant, another the head of a boar unknown, and one belonging, I think, to a "rongeur;" but what induces me particularly to wish them at Calcutta, is, that there is a horn in its matrix, which, connected as these fossils must be with those of the Nerbudda, might belong to that species of bos mentioned in your Journal; it is decidedly not a buffalo. I was so anxious to reach Bombay that I could not possibly go to Perim myself. I did, however, manage to send a boat over, and I received yesterday forty-one pieces of fossil bones, the greater part belonging to the "*Mastodon latidens*," of which the teeth, in a perfect state, did not leave any doubt; some of the bones are of immense size—one fractured piece of the tusk measuring from the centre 5¼, which gives 10½ inches diameter, or 34 inches in circumference; some of them are in the same hard matrix you will see imbedding the horn, some evidently rolled by the sea. There are some curious teeth among the fragments I possess, and two triangular-shaped pieces similar to the horn of a rhinoceros; the teeth are, however, too large to belong to that animal. I may perhaps send the most curious specimens round to you; but I am at this moment too much pleased with my discovery to part with them. It appears that the island abounds with the fossils, and it is a clear proof that the Nerbudda must have found only lately its way to the Cambay Gulf, or that some revolution must have separated the little island from Kattiawár. Having no opportunity to leave this for either Persia or the Cape, I may still perhaps be able to go to Perim and Gogo to trace the fossils on the mainland of the peninsula."

I may remark, that the conglomerates of the valley of the Nerbudda, which were so thoroughly examined by Spilsbury, and in which remains of Elephas, Hippopotamus, Equus, and Bos have been discovered, are now

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proved to belong to a later age than the Tertiaries of Perim, viz., the Pliocéne. The fossils of that district, therefore, have no connection with the ones in question, as Baron Hügel supposed.*

Major Fulljames was the next to visit the island, and it is to him we are indebted for by far the greatest amount of information we possess, both as to its physical features and geological character. In a letter published in the *Bengal Asiatic Society's Journal*,"† he gives a full description of the place. "On my arrival in this part of the country, in the month of April, I heard a report that some bones, turned into stones, as the natives called them, had been discovered on the Island of Perim, in the Gulf of Cambay, and in latitude 21° 29′. I lost no time in going there to see if the report of fossil remains was correct, and, although I do not pretend to be a geologist, or to know much about fossil osteology, still I consider myself most amply repaid by my first visit to the island, for I obtained a most perfect specimen of the teeth of the mastodon; one also, I think, belongs to the palæotherium; the femur vertebræ, and many other bones belonging to mammiferous animals now extinct." * * * Concluding, he sums up by saying—"I will here enumerate the varieties of specimens of fossil remains which I think have been found. Teeth of mammoth, Mastodon, Palæotherium, Hippopotamus or Rhinoceros, and a number of other large bones, one shell in siliceous sandstone, and the half of a deer's foot." * * * * *

From this time until 1845 nothing further was written or published on the subject of Perim fossils. In the month of June in that year, Mr. Albemarle Bettington, of the Bombay Civil Service, communicated to the Royal Asiatic Society of Great Britain and Ireland, an account

* The bone beds of Pyctun and Rakasbowen, in the Deccan, are of a Pliocéne age also.

† Vol. v. p. 289.

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of the cranium of some gigantic ruminant discovered by himself when on a visit to the island, and which he considered to be an entirely new genus. During the same year Dr. Hugh Falconer, the greatest authority of the day on Indian palæontology, having had occasion to examine the collections of Perim fossils in the British Museum and the Museum of the Geological Society, with reference to that magnificent work on the fossil fauna of Northern India, on which Colonel Cautley and himself were engaged, the *Fauna Antiqua Sivalensis*, gave to the world his very valuable memoir on some new forms and genera from that locality.*

The fossils of Perim are intended to be described in the *Fauna Antiqua Sivalensis*. The publication of this serial was commenced some twelve years ago; ten numbers of the plates appeared in quick succession, but only one of the letter-press. I am glad to say that this grand undertaking has been resumed after so long a pause, and we may expect soon to see it completed in the same masterly style in which it was begun.

If we take into consideration the small extent of Perim, I think there is no locality in the world which has furnished so many interesting remains of those beings which, during the second division of the Tertiary epoch, roamed masters of the earth.

Among the pachydermata, parts of that most singular of the class, the Deinotherium, have been detected. Dr. Falconer has the honour of being the first to discover that this extraordinary animal, which hitherto was supposed to be confined to Europe—its remains having been found only in Germany and France—once wallowed in the swamps and lakes of primæval India. In the memoir to which I have before alluded, he gives a long history of his examination of part of a molar tooth and a frag-

* "Journal of the Geological Society," vol. i. p. 356.

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ment of a jaw belonging to this animal, which, together with several other specimens found in Perim, had been presented to the British Museum by Miss Pepper. He instituted a comparison between these and corresponding portions of the *Dinotherium giganteum* of Kaup, and arrived at the conclusion that they were specifically distinct, and that the Perim one was larger than the *giganteum* and more closely allied to the mastodons. He has designated it *Deinotherium Indicum.*

Remains of two species of mastodon have, I believe, been recognised in the fossil fauna of Perim, one entirely peculiar to the locality—*Mastodon Perimensis*—the other, *Mastodon latidens.* Various parts of the hippopotamus have been discovered, but whether of the *hexaprotodon* or *tetraprotodon* it is impossible to say, and no distinct species has as yet been established. A separate form of rhinoceros has been detected, to which the specific title of *Perimensis* has been given by Falconer and Cautley. Remains of *Sus hysudricus* and of the hippotherium have also been discovered.

Among the *ruminantia* there is a very remarkable and interesting genus, which has been found in no other place. In form and appearance it must have approached most nearly to the *Sivatherium*—it also seems to have been allied to the giraffe. Major Fulljames sent home teeth and fragments of the jaws in the collection which he presented to the Geological Society. They were examined by Dr. Falconer, who at once recognized their generic distinctness, and applied to them the title of *Bramatherium*, thereby marking its relationship to the great *Sivatherium* of the Siválik Hills.

Camelopardalis Sivalensis has been placed by Dr. Falconer, too, on the list of the fossil Fauna of Perim. Several species of antelope and bos have been discovered and established. Among the *Reptilia* we find that gigantic

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tortoise the *Colossochelys Atlas*,* whose carapace reached the enormous length of twenty feet, and which, with the head and tail included, could not have been much less than thirty feet long! There are also several forms of fresh-water tortoises. Of the *Crocodilidæ* the most common are the *Leptorynchus*, resembling the Gavial or bottle-nosed crocodile of the Ganges, and a broad-snouted species. Vertebræ of fish,† two and a half to three inches diameter, are amongst the specimens in the Geological Society's Museum, but as yet they have not been determined.

It is worthy of notice that, whilst the fossil Fauna of Perim is coeval with, and of the same character as, that of the Siválik Hills and Ava, the various species are not identical throughout, and though reciprocally representative, are not the same.

Remains of the Deinotherium are wholly wanting in the Siválik Hills and the Irawaddi beds, but, as has been shewn before, they are to be found in Perim, and lately, too, they have been discovered at Attock, in the Punjab, by Lieutenant Garnett, of the Bengal Engineers.‡ *Mastodon Perimensis* is the prevailing form in Perim; *Mastodon Sivalensis* and *Mastodon latidens* in the Siválik Hills and Ava. Dr. Falconer tells me he has never yet seen an authentic specimen of elephant from Perim, but seven species have been discovered in the Siválik Beds and Ava. The *Sus hysudricus* is common to both Perim and

* Dr. Falconer, who discovered this singular animal, thinks it may have survived as a species till India was peopled with human beings; and he thinks this may account for some of the tales of Hindoo Mythology, which represents the world as supported by an elephant standing on the back of a tortoise.

The natives of India seem to have long regarded the fossils of the Sivalik Hills as remnants of giants slain by Ramchundra.

† Falconer. "Journal of the Geological Society," vol. i. p. 365.

‡ Falconer on the Species of Mastodon and Elephant occurring in the Fossil Slate in Great Britain. "Quarterly Journal of the Geological Society," November, 1857, p. 5.

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the Siváliks. *Rhinoceros platyrhinus, palæindicus* and *Sivalensis* are Siválik species. *Rhinoceros Perimensis* is peculiarly the Perim form. The *Hippotherium* is common to both localities. The *Sivatherium* is exclusively confined to the Siválik Hills, and the *Bramatherium* to Perim. *Camelopardalis Sivalensis* has been discovered in both places. *Camelus Sivalensis* has not been detected in Perim. The gigantic tortoise, *Colossochelys Atlas*, ranged from Perim to Ava.

As regards the distribution of land and sea during this epoch we can, of course, merely conjecture. Dr. Falconer tells me he is of opinion that the triangle formed by the Eastern and Western Ghauts and the Vindhya Mountains was formerly an island. From the base of this triangle a northern prolongation was thrown off in the Aravelli range, with various insular interruptions and rocky islets, as far as Hurrianah in the Delhi district. There were two gulfs, one occupying the Valley of the Ganges, the other of the Indus. A coast line of a nummulitic sea ran along the base of the Hala Mountains (on the west of the Indus) up to Peshawur into the Hindoo Coosh, where it turned eastward along the Himmalayas as far as Sylhet. The emergence took place early in the Miocene period, and the valley of the Ganges has not been submerged since.

Over this land, then, were spread immense and magnificent forests, and the densest jungles, in which roamed herds of Mastodons, Elephants, and Rhinoceri. In lakes, whose banks were clothed with the rankest vegetation, and whose waters were crowded with aquatic plants; and in rivers, rushing seaward to pour their tepid streams into gulfs in which prowled vast shoals of sharks, the Dinotherium and Hippopotamus sported and luxuriated—the former uprooting with his rake-like teeth the succulent aquatic plants which constituted his food. Here,

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too, voracious gavials and their congeners swarmed—they were the scavengers, and eagerly devoured and cleared away all decaying animal matter.

In corroboration of this theory, I may mention that extensive lacustrine deposits, altered and disrupted by basaltic rocks, have been met with over a wide extent of the Deccan, containing the freshwater shells *Paludina*, *Physa*, *Limnea*, *Unio*, and *Cypris*.*

The Sivatherium, Bramatherium, and giraffe no doubt were to be found on the Pampas-like plains, which extended far and wide over the land, and which were scoured too by the hippotherium, antelope, and bison. Reasoning from analogy, we might infer that a country whose fauna, independently of other singular forms, included those of the elephant, rhinoceros, hippopotamus, and giraffe, must have borne many points of resemblance to Southern Africa, the only land in the world where we find these four extraordinary types associated.

On the verdant isles on the coast, and in the mouths of rivers, rhinoceros, sus, deer, and carnivora no doubt abounded, just as we find them at the present day in similar situations in the mouth of the Ganges. It is easy to see how, during periodical inundations and floods, the remains of these animals would be swept into streams and carried out into estuaries and gulfs into which the rivers discharged themselves.

During the monsoon, when all the great rivers of India are swollen to an extraordinary size, immense quantities of bones of oxen, deer, horses, and bears, and masses of timber are carried down into the gulf of Cambay, in the waters of the Subbermutty, Mhye, Nerbudda, and Taptee, and imbedded in the vast beds of sediment which subside at their mouths.

The fossils of Perim appear to have been exposed for

* Malcolmson. "Geological Transactions." Series 2, vol. v. p. 570.

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some length of time to the action of the sea previously to being imbedded in the deposits in which we now find them; for I have specimens of fossilized wood which bear marks of most extensive ravages committed upon it by the destructive sea-worm teredo.

The indistinctness which is so characteristic of fossils from that locality, may not be entirely owing, then, to the operation of modern causes.

It was on the 18th of March last year, that, in company with my cousin, Mr. James Fleming, of Bombay, I visited the little island of Perim. We had been travelling previously through parts of the Deccan, Kandeish, Malwa, and Guzerat, and now having come into Kattiawar, as far as Gogo, we determined not to leave the district without seeing Perim, as we knew that very interesting fossils were to be found there. The thought of *fossiliferous tertiaries* was most refreshing. I felt well nigh sick of trap rocks, for we had hitherto seen hardly any other formation throughout the whole of our journey.

Embarking in one of the Bunderboats of the country, we set off in the morning, and with the swiftly running current in our favour, were carried along at a very fair rate. The tides, as I have before remarked, are extremely strong in the Gulf of Cambay, and that peculiar wave called the "Bore," is of constant occurrence. At the time of spring tides it rushes up the gulf with terrific violence, carrying vessels and everything before it. A boat happening to stick fast on a mud or sand-bank, is certain, on the return of the flood-tide, to be upset. This phenomenon is very common in the Ganges, where it almost equals in force that of the Gulf of Cambay. "In the Hoogly or Calcutta river," says Rennell,* "the 'bore' commences at Hoogly Point, the place where the

* "Philosophical Transactions," 1781.

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G.I		Tunicata	Brachiopoda	Monomyaria	Dimyaria	Pteropoda	Gasteropoda	Cephalopoda	Pisces	Reptilia	Aves	Mammalia
CAINOZOIC	Pleisto	●	●	●	●	●	·	●	●	●	●	
	Eocene	●	●	●	·	●	●	●	●	●	●	
MESOZOIC	Chalk	●	●	●	·	●	●	●	●	!	!	
	Green	●	●	●	·	●	●	●	●	·	·	
	Wealde	·	●	●	·	●	·	●	●	●	●	
	Upper	●	●	●	·	●	●	●	●	·	·	
	Oxford	●	●	●	·	●	●	●	·	·	·	
	Lower	●	●	●	·	●	●	●	●	!	●	
	Lias	●	●	●	·	●	●	●	●	·	!	
	Trias	·	●	Phillips	·	·	·	●	●	!	·	
PALÆOZOIC.	Permi	●	●	●	·	●	●	●	●	·	·	
	Coal	●	●	●	●	●	●	●	●	·	·	
	Mount	●	●	●	!	●	●	●	·	·	·	
	Devon	●	●	●	·	●	●	●	●	·	·	
	Upper	●	●	●	●	●	●	●	·	·	·	
	Lower	● ◎	●	●	●	●	●	·	·	·	·	
	Cambr	·	·	·	·	·	·	·	·	·	·	

● = ?

◎ Cambrian of Professor Sedgwick.

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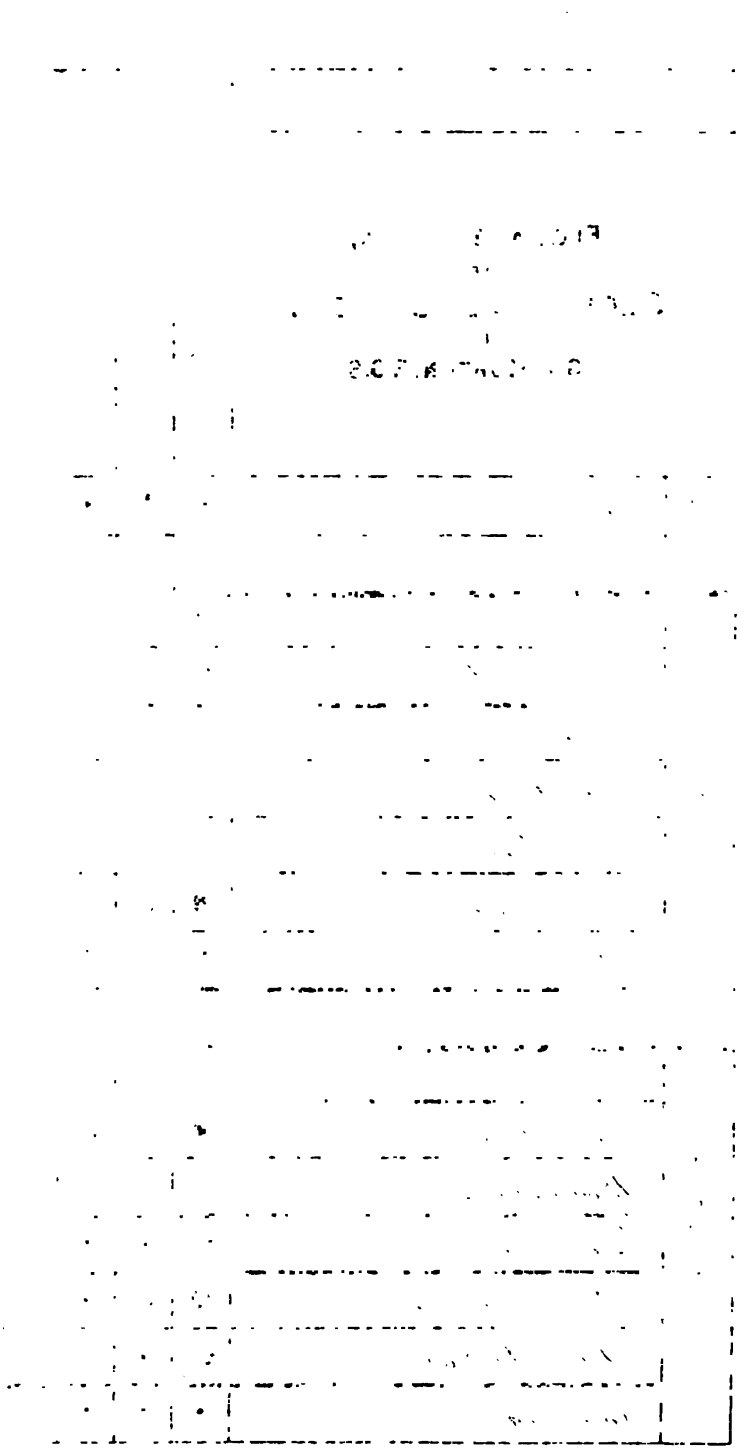
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river first contracts itself, and is perceptible above Hoogly Town; and so quick is its motion that it hardly employs four hours in travelling from one to the other, though the distance is nearly seventy miles. At Calcutta it sometimes occasions an instantaneous rise of five feet; and both here, and in every part of its track, the boats, on its approach, immediately quit the shore and make for safety to the middle of the river. In the channels between the islands, in the mouth of the Megna, the height of the 'bore' is said to exceed twelve feet; and it is so terrific in its appearance and dangerous in its consequences, that no boat will venture to pass at spring-tides." Sir Charles Lyell mentions having witnessed it on a very grand scale in Nova Scotia.* In our own country it may be seen in the river Severn, where the wave is very often nine feet in height. I have dwelt on this particular point, because in past ages, as at the present day, this phenomenon — supposing it existed — must have exerted considerable influence in producing marked changes in the districts in which it was prevalent, undermining cliffs, and carrying away from low shores remains of animals and trees, to be afterwards entombed in the bed of the ocean.

Away we floated down the gulf stream, the dazzling water breaking in melodious ripples on the bows of our little vessel. It was an intensely hot day; and lying under the awning we listlessly watched the receding coast of Kattiawar, which, overspread with a thin veil of mist, appeared dreamily indistinct and unreal. Our boatmen, thoroughly acquainted with the difficult navigation of the gulf, guided the craft most cleverly, and we could not but admire their dexterity.

* "Lyell's Travels in North America in 1842," vol. ii. p. 166. London, 1845. Quoted in "Lyell's Principles," p. 319.

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At length we came

* * * "unto a land
In which it seemed always afternoon;
All round the coast the languid air did swoon,
Breathing like one that hath a weary dream."*

We were at Perim, and what a dreary, melancholy spot the isle, which looked so bright in the distance, appeared now! The only vegetation visible was the gloomy mangrove tree, its tangled roots laden with sea-shells and weeds, and spreading around in all directions, seemed to luxuriate here, in its anomalous position between high and low water mark. Some of the Lascars who, from the lighthouse had been watching us approach, "came round about our keel," and helped us to disembark. Springing ashore we immediately commenced to search for fossils. Had we not been enthusiastic I think we should soon have given up, for it was no pleasant matter to grub away in banks of heavy mud, with a burning hot Indian sun beating mercilessly upon us.

We landed at the northern end of the island, and turning westward, continued our explorations until we came beneath the lighthouse. One of the Lascars told us that the best time of the year for finding the fossils is in the months of October and November, when the monsoon is over, and the heavy rains and seas which have prevailed during that season have either washed out fresh specimens from the matrix in which they are imbedded, or cleared away deposits of mud with which they are being constantly covered when once loosened. The fossils we discovered are for the most part very much sea-worn, having long been rolled about on the bare beach as boulder-stones. Many of them are so much disfigured as completely to defy recognition, and with many it is difficult to arrive at a correct conclusion as to their real

* "Lotos Eaters."—*Tennyson.*

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nature. However, there are some which have been made out. They are parts of mastodon, deinotherium, hippopotamus, hippotherium, antelope, zeptorynchus, and a broad-snouted crocodile.

Climbing over the sand-hills on the western side we reached the lighthouse, and from the high ground on which it stands we had a very excellent view of the whole island and the opposite coast. The sun was sinking gradually into the west, and the distant hills of Kattiawar were beginning to wear the rich purple tints of evening. Everything around was inexpressibly calm and serene—not a sound was to be heard.

We now returned to our boat, which we found well loaded with our collection, and, turning her head to the north, we loosened and drifted away. Perim grew dim and grey in the horizon, and at last we saw it no more. The sun was gone, and the stars came out, and it was late when we arrived at Gogo.

I should have been glad had we been able to make another excursion to the interesting little island, but so pressed were we for time, that it was impossible.

The next day but one we crossed the gulf to Tankaria Bunder, the port of Jumbooseer; and in little more than a week we were again at Bombay, from whence we set out on our long journey at first.

This paper was illustrated by drawings made by the author, numerous fossils obtained in the locality, and gigantic casts of organic remains lent for the purpose by the Committee of the Derby Museum. These casts had been presented to the town by the East India Company, and the Society recorded its thanks to the Corporation for lending them on this occasion.

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TWELFTH ORDINARY MEETING.

ROYAL INSTITUTION, 19th April, 1858.

DR. INMAN, PRESIDENT, in the Chair.

The resignation of Mr. J. P. G. SMITH was received.

JAMES YATES, Esq., F.R.S., informed the Society of the progress of the movement for introducing a decimal international system of weights and measures, and stated that the National Association had unanimously resolved to advise the adoption of the metre as the unit of length, but they had not yet decided on the unit of capacity and weight.

The Rev. H. H. HIGGINS exhibited a brooch made from the *Polyporus saligna* by an inmate of the Lunatic Asylum at York. It was much admired.

Mr. DUCKWORTH exhibited a fine specimen of the *Echinus mammillatus* dredged in the Red Sea.

Mr. MARRAT exhibited a number of lichens from South America, which illustrated the general diffusion of that class of plants, few of them differing from European species.

Mr. HIGGINSON drew attention to the phenomenon of complementary colours as found in printed matter, where black was used on green. Dr. THOMSON had noticed the same some years ago.

Dr. IHNE suggested an emendation in a passage of *Julius Cæsar*. It was that in which Cassius said to Brutus, when trying to persuade him to pronounce for liberty—

> Were I a common laugher, or did use
> To stale with ordinary oaths my love
> To every new protester; if you know
> That I do fawn on men, and hug them hard,

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> And after scandal them; or if you know
> That I profess myself in banquetting
> To all the rout, then hold me dangerous.
>
> *Act* 1, *Scene II.*

The difficulty occurred in the first line of the passage He had never seen any satisfactory explanation of wha Cassius meant by the term "a common laugher." Som early copies had "common laughter," which was stil worse. It struck him that they ought to be bold enough to correct the text here, and he would submit a word which would at least be consistent with common sense as a substitute for the existing one, which certainly con veyed no sense at all. The word he would suggest was "lover." It was used in Shakspeare's time for friend. It occurred in the same play, as when Brutus addressed the people as "Romans, countrymen, and lovers." In the Psalms it was used in the same sense—"Lover and friend hast thou put far from me, and mine acquaintance into darkness." "My lovers and my friends stand aloof from my sore." But it appeared, he thought, probable, that soon after Shakspeare's time, if not in his time, it was rather antiquated, and had quite lost its signification as friend, and hence the printer might have been misled, and substituted "laughter" for "lover."

Mr. YATES exhibited a portion of a Greek M.S. written by a community of Greek Monks in the Thebaid, in Egypt, giving an account of the Solar Eclipse of 1715.

The following papers were read at this meeting:—

"ON THE BRITISH HYMENOMYCETES." By the Rev. H. H. HIGGINS, M.A.—*See Appendix, page* 1.

"ON THE LOCAL FUNGI—Part I. HYMENOMYCETES." By the Rev. H. H. HIGGINS, M.A.—*See Appendix, page* 55.

Also, by the same gentleman,

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ON THE DEATH OF THE COMMON HIVE BEE, SUPPOSED TO BE OCCASIONED BY A PARASITIC FUNGUS.

By the Rev. H. H. HIGGINS, M.A.

On the 12th of March last, Timpron Martin, Esq., of Liverpool, communicated to me some circumstances respecting the death of a hive of bees in his possession, which induced me to request from him a full statement of particulars. Mr. Martin gave me the following account:—

"In October last I had three hives of bees, which I received into my house. Each door-way was closed, and the hive placed upon a piece of calico; the corners were brought over the top, leaving a loop by which the hive was suspended from the ceiling. The hives were taken down about the 14th of March, and two were healthy, but all the bees in the third were dead. There was a gallon of bees. The two hives containing live bees were much smaller, but in each there were dead ones. Under whatever circumstances you preserve bees through the winter, dead ones are found at the bottom in the spring. The room, an attic, was dry, and I had preserved the same hives in the same way during the winter of 1856. In what I may call the dead hive there was abundance of honey when it was opened, and it is clear that its inmates did not die from want. It is not a frequent occurrence for bees so to die, but I have known another instance. In that case the hive was left out in the ordinary way, and possibly cold was the cause of death. I think it probable that my bees died about a month before the 14th of March, merely from the circumstance that some one remarked about that time that there was no noise in the hive. They might have died earlier, but there were certainly live bees in the hive in January. I

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understand there was an appearance of mould on some of the comb. There was an ample ventilation I think, indeed as the bees were suspended they had more air than through the summer when placed on a stand."

When the occurrence was first made known to me, I suggested that the bees might probably have died from the growth of a fungus, and requested some of the dead bees might be sent for examination. They were transmitted to me in a very dry state, and a careful inspection with a lens afforded no indication of vegetable growth. I then broke up a specimen, and examined the portions under a compound microscope, using a Nachet, No. 4. The head and thorax were clean, but on a portion of the sternum were innumerable very minute, linear, slightly curved, bodies, shewing the well-known oscilating or swarming motion. Notwithstanding the agreement of these minute bodies with the characters of the genus *Bacterium* of the *Vibrionia*, I regarded them as *spermatia*, having frequently seen others indistinguishable from them, under circumstances inconsistent with the presence of *confervæ*, as in the interior of the immature *peridia* and *sporangia* of *fungals*.

In the specimen first examined were no other indications of the growth of any parasite, but from the interior of the abdomen of a second bee I obtained an abundance of well-defined globular bodies, resembling the spores of a fungus, ·00012 to ·00016 inch in diameter. Three out of four specimens subsequently examined contained within the abdomen similar spores. No traces of mycelium were visible; the plants had come to maturity, fruited, and withered away, leaving only the spores.

The chief question then remaining to be solved was as to the time when the spores were developed, whether before or after the death of the bees. In order, if possible, to determine this, I placed four of the dead bees in

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circumstances favourable for the germination of the spores, and in about ten days I submitted them again to examination. They were covered with mould, consisting chiefly of a species of *mucor*, and one also of *botrytis* or *botryosporium*. These fungi were clearly extraneous, covering indifferently all parts of the insects, and spreading on the wood on which they were lying. On the abdomen of all the specimens, and on the chypens of one of them, grew a fungus wholly unlike the surrounding mould. It was white and very short, and apparently consisted entirely of spores, arranged in a moniliform manner, like the filaments of a stemless *penicilium*. These spores resembled those found in the abdomen of the bees, and did, I think, proceed from them. The filaments were most numerous at the junction of the segments. The spores did not, I think, resemble the globules in *sporendonema muscæ* of the English flora, neither were they apparently enclosed.

The Rev. M. J. Berkeley, to whom I sent some of the bees, found, by scraping the interior of the abdomen with a lancet, very minute curved linear bodies, which he compares to vibrios. He also found mixed with them globular bodies, but no visible stratum of mould.

From the peculiar position of the spores within the abdomen of the bees, and from the growth of a fungus from them unlike any of our common forms of *mucedines*, I think it probable that the death of the bees was occasioned by the presence of a parasitic fungus.

At the conclusion of the paper, Mr. HIGGINS observed that other insects were subject to the attacks of fungi. A common instance was the small house fly, which was often to be seen attached by its proboscis to the window, and surrounded by a little white dewiness. This was the effect of fungus, which lodged in the body of the insect, and in the course of time made its way through the

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segments, shedding its spores, and producing the appearance to which he had referred.

The CHAIRMAN referred to an account which had been given of the destruction of silk-worms in the Sandwich Islands by something of the same kind. It was a very common disease in flies.

Mr. JAMES YATES, F.R.S., spoke of a caterpillar, from Australia, which had a fungus growing out of it.

Mr. HIGGINS remarked, that the same thing occurred in this country; and if people would only study nature around them they would see things quite as extraordinary and every whit as beautiful as those which excited so much surprise when they came from abroad. Returning to the subject, he would observe that the practical inference to be derived from his paper, was that bee-keepers should avoid placing bees again in a room where fungi had made their appearance; from the myriads of spores which they gave out, it would be certain destruction to the insects to do so.

Mr. YATES believed that essential oil was an effectual preservative. Virgil recommended it in the fourth Georgic.

The following paper was then read—On the

FLORA AND FAUNA OF GEOLOGICAL SYSTEMS.

BY GEORGE H. MORTON, F.G.S.

THE intention of this communication is to present an epitome of the classes of the vegetable and animal kingdoms, as they occur through successive geological systems; and to bring under consideration those classes which occur in the most ancient deposits, with the subsequent introduction of others, in the strata of the British Islands.

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The three primary geological life-periods are arranged into eight systems, each distinctly marked lithologically and palæontologically. These systems represent many long epochs of our earth's history; and though in some instances long intervals may have elapsed between them, yet each may be expected to afford us a very correct knowledge of a vast continuous length of time. The systems are again divided; and those divisions, most important and uniform in character, have been introduced into the illustrative table. To have detailed all such subdivisions would have extended the subject beyond due limits. The classification of the vegetable kingdom into five classes, and that of the animal kingdom into nineteen classes, includes all existing plants and animals. All these classes have been recognized in the Cainozoic period; and all fossil organisms that have yet come to light, can, with propriety, be placed under some one of the twenty-four classes adopted. The table is arranged so as to indicate the classes present in each system; and the diagram conveys an idea of the relative thickness of each of the representative rocks, and perhaps a very accurate one of the time occupied in formation, supposing, of course, the rate of deposition to have been uniform.

The earliest Flora we are acquainted with is that of the Lower Silurian; it consists of marine aquatic plants,* Thallogens; that humble class being absent in the Cambrian system. The first trace of a land plant is a Lepidostrobus—an Acrogen, at the very top of the Upper Silurian. We may, therefore, conclude that there were no land plants during the long Silurian epoch, a vast interval, far exceeding in duration any other system. In the Devonian system, in addition to Thallogens and Acrogens, are found the first trace of Gymnogens; but the remains of

* Algæ.

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vegetable life are very rare, though affording undoubted evidence of the existence of these three classes. In the Carboniferous system, the Acrogens and Gymnogens, unite and form its magnificent Flora, "the most splendid the world ever saw"—Palms, Endogens, are comparatively rare, being noticed for the first time. Of true Exogens* no trace has been discovered. In the Permian a similar Flora prevailed, though very much reduced in quantity. This system closes the Palæozoic period, Acrogenous plants having predominated Lepidodendron and *Sigillaria* forming thick beds of coal over large areas towards the close of the period.

Ascending to the Mesozoic period, we find in the Trias of this country all organic remains to be exceedingly rare, the plants are few in number, but, throughout the whole period Gymnogens are the prevailing type. Conifers and Cycadaceæ are abundant, and give a peculiar character to the vegetation. The Flora of the Oolite differs from that of the Carboniferous system, in the substitution of Gymnogens for Acrogens. In the Cretaceous system, plants are rare, but the former class is frequent in the green sand. In the Lower Cretaceous deposits of Aix-la-Chapelle there are abundant evidences of Angiospermous dicotyledons, or true Exogens; but nothing of this type has been observed in this country. With the close of the system terminates the Mesozoic period.

In the Cainozoic or Tertiary period, we find evidences of a very different vegetation, Exogens being decidedly the most abundant, the sub-class Angiospermæ far exceeding the others. The Endogens, especially the Palms, are numerous, but the Acrogens are comparatively rare. The Flora of the latter part of the period approximates nearer to that of recent times, yet differing much from our present European vegetation. The climate must have

* Trigonocarpum, Cyperaceæ, &c.

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been much warmer, probably the result of a different distribution of land and water, that only assumed its present configuration towards the dawn of the modern period.

Adopting the classification of Sir Roderick J. Murchison and the government geologists, the Cambrian system, represented by an immense thickness of deposits, contains only the remains of Bryozoa and traces of Annelida, the former found in Ireland only. If we adopt the nomenclature of Professor Sedgwick, the Cambrian system yields Zoophyta, Annelida, Crustacea, Bryozoa, and Brachiopoda; but, according to the former arrangement, that most generally accepted, these classes appertain to Lower Silurian rocks, in which are also found Amoryshozoa, Echinodermata, Monomyaria, Dimyaria, Pteropoda, Gasteropoda, and Cephalopoda. The Crustacea and Brachiopoda are the most numerous. In the great Silurian system all the marine classes of animals, excepting Cirrhipedia, are undoubtedly present. The Cephalopoda,* the highest class of invertebrata, existed in the Lower Silurian, though not in the lowest zone; and at the latter part of the epoch, judging from their great size, they appear to have performed the duties of fishes. The Silurian was a long period abounding with invertebrata, when all those classes of life were spread over the earth: we find their remains by millions, yet the most careful searches have failed to produce even a trace of a vertebrated animal.

During the deposition of the Silurian rocks collectively there appears to have been no fishes. The Cephalopoda were then the most highly organized beings that existed, until just at the close of the period, in the upper Ludlow shales, we find the first traces of fishes.† They are exceedingly rare, and consist of teeth and fragments of about seven species of Placoids.

* Lituites and Orthoceras. † Onchus, Sphagotus, &c.

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It is, of course, impossible for us to calculate the time occupied by the Silurian era; but from the immense depth of the deposits representing the system, their constancy over such vast regions, and the evidence of the organic remains, we may safely conclude that its duration must have far exceeded that of any other; yet each succeeding layer, if only a few inches, tells us of the order and regularity that prevailed, and often leaves us faithful and imperishable remains of the earliest life that existed upon the earth.

Ascending to the Devonian system, as with each succeeding advance, we find a continual substitution of genera and species, but never a repetition of one that had previously died out or become extinct. Species seem subject to some such natural law of life and death as individuals.

In this era the number of Crustacea is much reduced. Fishes are found in so perfect a state of preservation, and in numbers and variety so remarkable, that though they were all very much unlike those of existing nature, we have obtained a very correct knowledge of their structure. It is very interesting to observe, in the upper part of this system, the discovery of the first reptile* (of the Lacertian order), a step higher in the vertebrated series. Of the invertebrata no class has been found that is not also in Silurian strata.

In the Carboniferous system fishes were abundant; the Ganoids† of this era are very interesting, for they appear to have occupied the place of the large reptiles that were destined soon after to replace them. In this system only one true reptile has yet come to light; it is of the Batrachian order,‡ so that we may conclude they were but rare; and the sauroid character of the

* Telerpeton Elginense. † Megalichthys, &c.
‡ Parabatrachus Colei.

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fishes lead us to the conclusion that this rarity was real, and that air-breathing animals formed but a small proportion of the entire fauna.

The organisms of the mountain limestone and of the coal-measures, differ essentially to the extent that might be expected of marine and fresh-water deposits. In the latter we find the earliest Insecta of the orders Coleoptera and Neuroptera.

In the Permian system the reptiles are more numerous, though still rare. No class of the animal kingdom is present that is not also in the Carboniferous system, and no invertebrated class not also found in Silurian strata, while in each the number of observed species is considerably less. This system closes the Palæozoic period. Afterwards the Flora and Fauna become so changed, that most of the generic types, and certainly all the species, of both plants and animals appear to have been replaced by new ones. All nature assumes a new aspect, and reveals as it were a new creation. In the fishes this change is very striking, in the well-known heterocercal and homocercal forms, as they emerge from the Permian to the Triassic systems.

There can be little doubt but that these great organic changes were intimately connected with the comprehensive disturbances that marked the close of the Palæozoic period. The complicated upheavals of the Carboniferous and Permian strata seem to have chiefly occurred at this time; and when we consider the gigantic nature of these convulsions, we cannot be surprised at the scanty traces of ancient life afforded to our view in the succeeding Triassic system. The tract of country in England occupied by the Trias or New Red Sandstone is as extensive as that of any other; yet the paucity, and often total absence, of organic remains is remarkable. The diffusion of per-oxide of iron through the waters, and the unstable

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condition of the land, may have acted against the propagation of life over immense tracts, and account for the rarity of organisms in our British strata; or the extinction of all the Palæozoic races may have left a sterility in nature over extensive regions, awaiting the dispersion of new forms of life from peculiar centres, such as the Muschelkalk, where we obtain a rich variety of Mesozoic life. The Trias was probably dislocated and elevated soon after its deposition, when the most prominent geographical features of the high land of the British Islands received its present character, later disturbances merely affecting its general level.

Ascending to the Oolitic system, we find all the classes of the animal kingdom represented excepting Pteropoda. The first example of pedunculated Cirrhipedia is found in the Stonesfield slate; the sessile Cirrhipedia have not been noticed in Mesozoic strata. Of Insecta, Coleoptera and Neuroptera are found in the Inferior Oolite, Lias, and Wealden strata; these two orders, and Orthoptera, Homoptera, and Diptera, in the Lias and Wealden only. Insect remains occur also in the Kimmeridge clay. Problematical bones of Birds have been found in Stonesfield slate, Inferior Oolite; an observation authenticated in remains from the Wealden. The occurrence of the footprints of Birds, however, indicate their existence from the Triassic epoch. In this system it is interesting to find the earliest evidence of Mammalia. The lower jaws, with teeth attached, of Marsupials, have been found at Stonesfield in the Inferior Oolite,* and in the Purbeck or Wealden strata;† and on the continent, mammalian molar teeth and fragments of bone have been found, in a bone breccia, at Wurtemburg—strata corresponding to the bone bed of our Lias at Aust.

* Amphitherium, Phascolotherium, &c.

† Spalacotherium, and thirteen new species.—*Lyell's Elements*, 1857.

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The existence of this class might easily have escaped attention, for it is maintained from not more than ten fragments of the jaws, and a few detached bones from Stonesfield, and from the more numerous remains, very recently collected in Dorsetshire, out of a bed only about five inches thick, in the Middle Perbeck or Wealden strata. The animals to which they belonged were of very small dimensions, most of the jaws being under an inch in length. The Oolitic system represents a long and interesting era: it has probably received a longer and more constant attention than any other, rewarding the researches of Palæontologists with a profuse variety of extinct creatures. The chief characters of the formation is the extraordinary development of the Cephalopoda and Reptilia, the latter so numerous, that the era has been styled the "Age of Reptiles."

In the Cretaceous system is a similar Fauna to that of the Oolite, but with generic and specific characters peculiar to itself. It is reported that there have been traces of Birds and Mammalia discovered, but we may consider that very doubtful. The system seems to have been a deep-sea deposit, some of its members being almost entirely composed of the cases of Foraminifera.

Previous to the Cretaceous era all the Fishes were of Placoid and Ganoid types; now, the Ctenoid and Cycloid orders are observed. Afterwards, in the Cainozoic period, they became far more numerous. At the end of the Cretaceous epoch, which is also the termination of the Mesozoic period, an elevation of the strata took place, which probably considerably modified the geography of surrounding lands and continents. There was also a total change or substitution of the Fauna: considering these two circumstances together, the relation between them is very evident. In England we see the chalk cliffs, not only elevated, bnt thrown into a vertical posi-

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tion; and also find the whole series of Mesozoic types destroyed, in consequence of convulsions, and elevations of the sea bottom.

After the close of the Mesozoic period, a long interval seems to have elapsed before the lowest Cainozoic strata were deposited unconformably upon the deranged Cretaceous rocks. The connecting links, though absent in the British Islands, are partially displayed on the continent. Further investigations may, perhaps, hereafter enable us to ascertain the nature of great organic changes, coincident with great subterranean movements; for it cannot be too strongly impressed upon the mind, that these breaks in the continuity of the strata only exist over a certain area, or over regions subject, directly after formation, to extraordinary elevatory movements; and that distant places may afford evidence to fill up the missing links, and render more perfect one great geological history, of which our systems are mere arbitrary divisions. If convulsions and upheavals of the earth's surface account for the destruction of all prevailing forms of life existing at the time in a particular region, the occurrence of very different types in the succeeding deposits, is rather the index of gradual changes during the interval, that sedimentary deposition had been suspended, than of an extraordinary vitality of creative energy in the sudden introduction of new species.

Referring to the Upper Palæozoic period, we find Placoid and Ganoid Fishes most conspicuously developed. In the Mesozoic, Reptiles were more strikingly prominent, performing their functions in the sea, Enaliosauria; upon the land, Dinosauria; and in the air, Pterosauria; but, in the Cainozoic, is a still greater advance in creation. Birds and Mammalia occupying the position held by the Reptiles of the former period.

The fauna of the Cainozoic period is represented by

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every recent class, but the species indicate a great difference in climatal conditions from that now prevailing in this part of the world; we recognize them as allied to present tropical or sub-tropical forms. All the existing orders of Mammalia have been observed. The Quadrumana, Cheiroptera, Insectivora, Marsupialia, Cetacea, and Pachydermata, are found in the Eocene. Birds, and all the recent orders of Reptiles and Fishes, are also present.

The Eocene is remarkable from the absence of Ruminants and Carnivora; the first indication of the former occurs in Pleistocene or newer Cainozoic. The mammals of the Eocene are now all extinct. Most of the Pleiocene and Pleistocene are also extinct: many of these were lost during the time of the northern drift, when probably the last change in the configuration of the land took place. The evidence of the organic remains indicate a great but very gradual change in the climate of Europe, no doubt caused by the elevation of the Alps and other mountain chains, and a very considerable addition to the dry land of Northern Asia.

Before deducing any conclusions from geological facts observed in the strata of the British Islands, it must be obvious that the investigation of other countries is of paramount importance; for if the British strata present all the main facts that can be derived, from a general examination of the strata that have yet been examined by geologists in many distant parts of the world, then we can place more reliance upon any conclusions we may arrive at, though based upon the negative evidence afforded in this country. In India, Australia, and in America, there is a constant analogy and connection between the rocks of those countries and our geological systems. At the last meeting of the British Association, there were maps representing large tracts of India and

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North America, geologically coloured according to our own classification, and described by the surveyors who had constructed them after examining the countries, and who described their embedded fossils as similar to our own. Professor Rogers even exhibited a Crustacean* from the Lower Silurian of North America—a well-known North Wales species—as affording evidence of what he termed "a very ancient sympathy between the two countries." The analogy of genera and species over such wide regions is very remarkable, and unlike the facts observed in the present day. The theory of the universality of the most ancient Fauna may, however, be modified, according to the observations of M. Barrande, who seems to have discovered distinct zoological provinces in the Silurian strata of Bohemia.

The records of the Flora and Fauna of foreign representatives of British systems, do not differ essentially from those recorded in our own strata. A compilation of the organic classes peculiar to each successive era, would differ very little from the one before you representing the British strata. There is no occurrence of Vertebrata in earlier strata than it is in England; and to the first examples of Fishes, Reptiles, Birds, and Mammalia, the main interest of the subject is attached. The discovery of Chelonian Reptile tracks in the Lower Silurian of North America requires confirmation. The mammalian jaw, described by Dr. Emmons, from the Permian strata of that country, is assigned to the Lower Oolite by Sir Charles Lyell. It is probably the most ancient example of mammalian remains yet discovered.

Palæontology is a science in which new discoveries are liable to alter its conclusions, in respect to the range of organic remains through successive systems, and, therefore, any deductions arrived at, are simply the results of

* Paradoxides Forchhammeri.

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our present knowledge; the absence of the vertebrated classes in the lowest strata being based upon strong negative evidence. Of course it is possible that the Vertebrata may have existed, from the earliest creation of life, upon the earth; yet not only have the most rigorous researches of many years failed to discover a trace of their remains, but, judging from the gradual development or substitution of the vertebrated classes through so many phases, until they assume such importance in the Mammalia of the Cainozoic period, the conclusion that such high types of life were altogether absent during the first great life epoch appears strongly confirmed. Notwithstanding the careful search that is constantly in operation, several years have now elapsed without developing any new facts of importance tending to lower the range of classes. The longer it continues we may the more safely begin to trust the value of our conclusions, and to assume that time will give them the character of truth.

In conclusion, we find the remains of the earliest organic body that we are acquainted with is a Bryozoon.* perhaps associated with Annelids. If these were the first creatures that ever existed upon the earth, how interesting to look upon their remains, and to find that they are by no means the lowest animals in the scale of organization. But have we really found such?—or is it one of the first traces of the spread of life from some distant centre, where the first creation unveiled itself in many classes, perhaps even the entire invertebrata with which we become acquainted as we ascend the Silurian system; the epoch that undoubtedly is the first great life era that we can separate in geological sequence. After the Bryozoa and Annelida, the first or lowest classes observed, are Zoophyta, Crustacea, and Brachiopoda; and so far as

* Oldhamia radiata.

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we are able to ascertain, these composed the most ancient Fauna of the ocean. They were soon afterwards followed by the Cephalopoda, and many other classes. The only class of comparatively recent introduction is Cirrhipedia. The sessile Cirrhipedes are only found in Cainozoic strata, becoming so abundant towards its close, and now so universally spread over the world that the present time might be styled the "Age of Cirrhipedes." *

The first evidence of the vertebrata, in the upper Silurian, has been already adverted to in the occurrence of Placoid Fishes, in the Ludlow Shales. The earliest Reptiles in the Devonian and Carboniferous systems shew how long that class existed before it arrived at its maximum in the Mesozoic period. The first trace of Birds seems indicated by their footprints in the Trias, though the earliest undoubted examples are in Wealden and Eocene strata. The first Mammals appear in the Inferior Oolite, more frequently in the Wealden; their present importance in the economy of nature being coincident with the commencement of the Cainozoic period, in every region where such strata have been identified. With the accumulated observations of geologists to rely upon, and the very general manner the subject has been treated, I hope to have correctly placed it before you. The object has been to shew a correct tabulation of facts, and their relation, according to the present state of our information.

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* Darwin.

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THIRTEENTH ORDINARY MEETING.

ROYAL INSTITUTION, 3rd May, 1858.

DR. INMAN, PRESIDENT, in the Chair.

THE Rev. H. H. HIGGINS exhibited Corundum from Asia Minor and Naxes, and observed that, owing to the high price of the mineral, efforts were being used to obtain it for commercial purposes from the coast of Coromandel.

Dr. EDWARDS exhibited some specimens of aluminum and other substances in the amorphous form, likewise the silicate of soda; observing, with regard to the last, that it would probably come into very general use for important purposes. Thus it might render garments uninflammable; would by its detergent qualities become a useful ingredient in soap; was serviceable in fresco-painting, sizing of calicoes, and as an adhesive cement, where hot water did not come in contact with it.

Mr. COCKER'S new patent Wire-guage was shewn and explained.

The paper for the evening was then read:—

ON REARING MACRO-LEPIDOPTERA.

BY JAMES FITZHERBERT BROCHOLES, Esq.

IN order to make this paper the more thoroughly understood, it may be well here to explain, or rather define, the term Macro-Lepidoptera.

Entomologists divide butterflies and moths into two sections, under the titles *Macro-Lepidoptera* and *Micro-Lepidoptera*.

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The former comprises the first five tribes, namely, the *Rhopalocera* or Butterflies, the *Sphinges*, the *Bombyces*, *Noctuæ*, and *Geometræ*. Though some of the species included in these are small, the majority are large.

The latter section comprises the *Pyrales*, *Crambinæ*, *Tortrices*, *Tineinæ*, and *Pterophoridæ*. In these tribes a few of the species are moderately large, but the majority are small.

To go out and collect a number of larvæ, without previously providing suitable places for them at home, would be folly; a few remarks about breeding-cages will, therefore, not be out of place.

A large box, measuring half a yard or two feet square, will be very useful; especially for those insects which spin cocoons or webs, and for such as remain only a short time in pupæ. The box should be constructed on the plan of a meat-safe, the sides and top being of fine wire gauze, nailed tightly on a frame-work of wood. It is immaterial whether the top or a side be the doorway, provided a full view of the whole interior can be obtained. Moss should be placed in the bottom, to the depth of several inches, for the caterpillars to bury themselves in when about to become pupæ; and there should also be a fair quantity of ledges and corners throughout the box, to form asylums for the web-spinners and others which do not bury. The wooden bottom of the cage absorbs much of the moisture from the moss, whilst there is a constant drainage from the surface by means of evaporation through the wire gauze on the sides and top; hence, a dryness ensues which is very prejudicial both to larvæ and pupæ. This must be obviated by frequent waterings. On the other hand, too much moisture is equally injurious and care should be taken to preserve a medium. Should the box be allowed frequently to become quite dry, waterings cause it to grow mouldy, and the insects die;

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hence, it is necessary to keep it as much as possible equally moist.

For those species which spend the winter, or any lengthened portion of the summer in the pupa state, either under ground or amongst moss, &c., the following is an admirable cage: Take a large flower-pot and fill it one-third full of fresh, sweet moss, then place it upon a soup-plate full of water, and tie book-muslin over it.

The evaporation of the water, passing through the hole in the bottom of the pot, keeps the moisture in the moss nearly at the right point, so that the trouble of frequent waterings is obviated; but an occasional one is nevertheless advantageous. A number of flower-pots, fitted up in this way, enable the entomologist to keep each species of larvæ separate; to treat each as it requires; to watch each through its several transformations; and to arrive at conclusions more readily than he could do by keeping all in one large box. The pots also may be kept either in or out of doors; whereas, a box would soon be flooded, and the larvæ and pupæ drowned, if kept where rain has access. The box, moreover, would soon be destroyed.

When the cages are tenanted by larvæ, care should be taken to keep them airy, sweet, and clean, otherwise diseases are generated which prove fatal to the moths in one or other of their stages. When many caterpillars have been reared in one cage it necessarily becomes charged with refuse, so that, when the insects are all hatched, fresh moss should be substituted for the old, taking care, of course, that no good pupæ are thrown away in the change.

It sometimes happens that individual specimens remain in the pupa state for some time after the majority have flown, and odd ones of good species are valuable. Such domiciles are alone necessary for the rearing of

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Macro-Lepidoptera in general. There are, however, a few exceptions, and these are what entomologists call internal feeders. These live in and feed upon the boles and branches of trees, stems of plants, &c.; and as wood is in many instances their natural food, they cannot be expected to refrain from eating their way through the sides of a box or the lid which covers a pot. These are very difficult to rear, and will again be spoken of. But whilst on the subject of breeding-cages, confectioners' glass jars, with glass covers, may be mentioned as useful and suitable for them. As fresh air is necessary for the well-being of these larvæ, either the lids must not fit tightly, or, if stoppers are used, holes must be drilled through the glass near the top of each jar.

Though preparations have been thus made for the reception and safe custody of the caterpillars at home, the entomologist is only half prepared. He has still to be provided with means for ready capture and conveyance to future quarters. His wants, however, are few and simple, and consist of a dark lanthorn to aid him in looking for those larvæ which are difficult to find by day; an umbrella or large net to place under the bushes or branches of trees whilst beating; a stout walking-stick, a sandwich box, and a few chip-boxes for the reception of the caterpillars.

The new season commences with the new year, and there is little to be done during the first two months. Many moths spend this season in the ova state, attached to webs, trunks of trees, twigs, blades of grass, &c., sometimes singly and sometimes in numbers. In some situations these are easily found, whilst in others with such difficulty that they require patience, perseverance, and a quick eye, to ensure success in finding them. Valuable and rare insects are sometimes found in this state; and it is well to look for them, since many species are most easily obtained by procuring their eggs.

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Though the Tit tribe *(Paridæ)* feed on them, this havoc is small compared with that which awaits them after leaving the ova state, from birds in general, ichneumon flies, and other enemies.

Much may be done at this season by digging for pupæ; but on this subject the papers by the Rev. J. Green, published in the *Zoologist*, pages 3888 and 5382 may be read.

Many Lepidoptera spend the winter as larvæ, which remain dormant during severe weather, and come out to feed in early spring on mild evenings. Some of these are of advanced growth, and require but little food before they become pupæ. They must not be disturbed from their hibernacula, as such treatment would often prove fatal to them, but should be sought for when nature has recalled them to animation. In some instances, however, they do not leave the webs in which they have slept before they assume the winged form. When found, these may be carefully removed to the breeding-cage without being disturbed. The majority of caterpillars are still young; and though on mild evenings many may be found feeding, it is well to leave them till more matured, since, if taken while too small, they often pine away and die. The supply of food, too, at this early season, is precarious, and it is better to leave them to nature than to take and starve them. March is now at hand, and with it the entomologist must begin to work with more vigour.

The larvæ of *Cleora lichenaria* do not seem to become torpid at all during winter, since they may be found in severe as well as in mild weather. They are becoming fine now, and may be procured on the lichens which grow so freely on the trunks of trees. In colour they closely resemble the plants on which they live, and require to be carefully looked for. They are very subject to the attacks of ichneumons, but in other respects are

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easily reared if taken when tolerably well grown. If placed with some lichen in a jar covered with book-muslin, they will thrive without any care beyond occasionally damping the lichen, and preventing it from growing mouldy. As they are caterpillars which rest in exposed situations, they may be sought for during the day. When full-grown they change to pupa in a web spun among the lichen.

The majority of caterpillars are nocturnal in their habits, and must therefore be sought at night by the light of a lanthorn. It is true, a few may be found amongst plants, and under broad leaves, &c., in the day-time; but to obtain many, we must look for them whilst they are feeding. Of course, we are speaking now of those only which live on grasses and other low plants; and these must be sought for on banks and other places where the vegetation is forward. When their evening meal is finished, as if conscious of security during the hours of darkness, they often crawl up to some exposed place on the tall stem of a plant or bush, there to rest until hunger or the morning recals them to the ground. All such places must, therefore, be examined, as well as the plants which actually form their food.

In collecting and keeping caterpillars they must not be crowded in too small a place, or they will sweat, become enfeebled, and eventually die. Like most other beings they require plenty of both air and room. When a number of larvæ are stored away in cages they must be well supplied with fresh food, or they will either not arrive at maturity or come out small, dwarfish specimens. They must also be furnished with those plants on which they have been found feeding, since many would reject other food and die of starvation. Some species are restricted to one or two plants, others are found on one genus or tribe of plants, whilst many feed on almost any-

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thing that happens to be near them. With the last-mentioned there is little difficulty, but with the two former there is often much trouble.

The larvæ of *Epunda lichenea* should be sought for now in places where their food-plants, namely, the Glasswort *(Salicornia herbacea)*, Ragwort *(Senecio Jacobæa)*, Wall Pepper *(Sedum acre)*, and Foxglove *(Digitalis purpurea)*, grow. They increase rapidly in size, and as the majority will soon disappear, time must not be lost in obtaining a supply. When the entomologist has procured some, he should also take home a sufficiency of those plants on which he found them feeding. With regard to these plants, the naturalist must use his judgment as to whether it would be better to put them into the cage growing in the sod, or with the stems put in water in order to keep them fresh. Grasses and many low plants can be given in the sod when required; and on rejecting one which no longer supplies proper food, the roots should be examined for concealed larvæ, and the soil shaken out, lest a caterpillar has buried itself or changed to pupa in it. Then tall plants, or portions of the branches of trees and bushes, can be supplied to those which feed on them, with the stems or branches in a pickle jar or bottle of water.

Caterpillars are peculiar in their habits. Too many of them, especially web-spinners, should not be crowded together, as they would be in each other's way and cause death. In an overstocked box, the larvæ are deprived of their necessary rest by their restless neighbours molesting them, and others are prevented from completing their webs by wanderers crawling over and tearing them down, until at last many die of pure exhaustion. Then, again, diseases are generated which decimate the population, until the entomologist has perhaps only a few of his stock left. Diseased and dead larvæ, or those attacked by

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ichneumons, must always be ejected; and ichneumons, in all their stages, must, without delay, be banished from the cages.

When a box is well stocked with pupæ, it should be left undisturbed until all its tenants are hatched, and then it can be put in order for new occupants. The larvæ which feed in spring and the early part of summer become moths before winter, and those which become pupæ later in the season assume their last form in the following year. Curiosity must not be allowed to induce the entomologist to disturb or handle his pupæ, since such treatment would often kill them.

To proceed with out-door work—the grass and other low plants are fed upon throughout the season, and may be searched accordingly. There are no leaves on the trees and bushes as yet, so on these, as well as on the majority of evergreens, many larvæ must not be expected. The hardy and lowly, but beautiful heaths, are, however, exceptions, and these form the food of several insects which should now be sought. Later in the season they are again frequented by the larvæ of *Saturnia carpini* and *Anarta myrtilli*.

March is at last drawing to a close, and giving place to the more genial April. Birds are beginning to sing, buds of trees to burst, and flowers to expand, and the favourites of the lepidopterist are already assuming wings. The sallows are in full blossom, and when they have afforded one rich harvest of winged forms, they will furnish another of larvæ.

Whilst the bloom is still upon the flowers the very young caterpillars of *Xanthia silago* and *X. cerago* are feeding within them. When the flowers, therefore, no longer form an attraction for the perfect insects, they may be gathered for their living contents. It may be asked how the catkins are to be known which contain

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larvæ. Whether the eggs are laid in the buds or not, remains to be discovered, but it is certain that the young larvæ are within them. As the buds expand, and the young caterpillars increase in size, the catkins become dead and contracted in the part where the cause of the mischief lies concealed. The malformation, then, will always betray them. The willow bushes, growing near woods where the insects are known to be, will be found most productive; but great attention will be required in rearing those obtained. In order to ensure success place the gathered catkins indiscriminately in a confectioner's glass jar, in order that the little larvæ may not be lost when they leave their old habitations. The great quantity of contained moisture will soon begin to evaporate, and as it cannot escape through the glass, it will cause the catkins to become mouldy. They are then no longer fit for food, and the young larvæ leave them to search for something more wholesome.

In confinement they thrive well upon the expanding leaves. A second jar, which is sweet and clean, should now be ready to receive them; this must contain a few willow twigs bearing a good supply of advanced foliage, and having their ends in a bottle of water to keep them fresh. The caterpillars can now be transferred to this as they present themselves, and when they have all been taken from the first jar, it may be cleaned and prepared to receive them again when they require another supply of food. Whilst young they are very delicate, and in their removal care should be taken not to handle them too roughly; and it is better to move them with a blunt pin or something of the kind, rather than with the fingers. When large enough they may be placed in one of the flower-pot cages.

All small larvæ should be kept at first in jars as described, and supplied constantly with their proper food, as many,

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if not all, would be lost if placed at once in a large cage.

Probably the entomologist has a supply of eggs of one or more kinds, some of which may be hatching now; if so, each kind must be treated separately in the manner just described, and careful watch must be kept on them, in order that the young larvæ may be placed upon their food whenever they make their appearance.

The genial influence of April has already restored the hibernating larvæ of *Lasiocampa rubi* and *Phragmatobia fuliginosa* to animation. For a short time they wander about in search of suitable places wherein to spin their webs. Both are conspicuous hairy caterpillars, which, when obtained, should be placed in the large wire-gauze box, previously furnished with moss; there they will readily undergo their transformations. The cocoons, which were spun before the entomologist sought for the insects, may be found amongst the short thick grass or other herbage growing in the places frequented by them. These should be carefully taken from their original situations, conveyed home in a sandwich box, and laid gently on the surface of the moss in the cage. In due time good specimens will be the reward of industrious attention. Like the grasses, the reeds are obeying the genial influence of spring, and are already ornamenting their natural localities with tall stems and green leaves. They are the food of various species of *Leucania* and *Nonagria*, and should, therefore, now be examined.

The sandhills also are losing the bleak and desolate appearance which they had in winter, and are gradually becoming covered with vegetation. The Stargrass *(Carex arenaria)* is springing up also, and its young shoots afford food for the larvæ of *Leucania littoralis*, which should be sought in the latter part of this month.

It is a singular fact, that almost from the first expanding

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of the leaves on trees and bushes there are caterpillars to feed upon them, and on some trees it is particularly the case. So far in the season the majority of forms have been comprised under few types, but now fresh ones will constantly appear. Hitherto two very dissimilar larvæ of *Bombyces* and a number of those of *Noctuæ*, which were pretty nearly alike in form to a larva of the *Geometra*, are all we have seen. In colour there were many variations, but the shapes have been restricted; now the trees and bushes, as well as low plants, will constantly afford other forms, which will be spoken of hereafter.

The caterpillars of some *Noctuæ* may be found during this month in woods, crawling on the trunks of trees at night. Sometimes these are attracted by the syrup placed to entice moths, and are found at it when the entomologist goes with his lanthorn.

The operations of April being now over, we come to those of May. As the larvæ on trees and bushes are as yet very small, and in many instances not even hatched, we will leave them to Nature, and say a few words about internal feeders. These occur in many situations, and at different seasons of the year; and as we have not met with many of the larger species we will speak of them for the most part in general terms. First on the list is the Goat-Moth *(Cossus ligniperda)*, whose larva causes great damage to various trees, amongst which may be mentioned the oak and willow. These caterpillars are gregarious in their habits, and feed upon the solid green wood, eating their way, and forming in their line of march long galleries in various directions. When the larvæ are full-grown, the gallery formed by each is large enough to admit the thumb; but it not unfrequently happens that specimens of various sizes and ages occur in the same tree. They feed for two or three years; and when a brood have left

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their old haunts, the bark peels off leaving traces of Cossus ligniperda but too apparent. Trees presenting the ravages of former tenants are to be found everywhere, but broods at present existing are not so easily discovered. How are the full-grown larvæ to be found, when the bark which covers them appears uninjured? They require air, and to admit it there must be holes somewhere. These holes serve also another purpose, which betrays them; as they advance through the tree their excrement fills up the gallery behind, so that when they retrace their steps a quantity is necessarily ejected; this falls to the ground, unless projecting bark, a branch, or something else detains it more conspicuously. Their fetid smell also betrays them at a considerable distance. Of course their position makes them difficult to obtain; but it sometimes happens that full-grown ones are immediately under the bark. These are pretty easily secured, and should be treated as follows.

In a confectioner's glass jar place a portion of a living branch of the tree in which the larvæ were found, and also a quantity of sawdust. If the jar in which the caterpillars are established be kept free from mould, all will go well, and the tenants will give little trouble. They are full-fed in autumn, become pupæ in spring, and assume the winged state in June and July.

Our next species in this series will be the *Sphinx*, *Ægeria bembiciformis*, which we will not attempt to rear in an artificial breeding cage, but which we leave to nature. The larvæ of this species feed in the living wood under the bark of poplars, and are so difficult to rear by artificial means that the attempt is almost useless. They assume the pupa state about the end of May or early in June, and fly in bright weather at the end of June or during July; on cloudy days and at night they are at rest upon the trunks of trees, foliage, &c., and are then seldom

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seen. They are hatched principally between six and nine o'clock in the morning; and for some little time after emerging from pupa they remain upon the trunk of the tree stretching and drying their wings, when, of course, they are readily taken. If the entomologist will, during these hours, visit the trees frequented by them, he will, with comparative ease, acquire a supply of good specimens. As they are very lively, they must not, by any means, be put into pill boxes, as they would soon spoil themselves, but must be pinned at once. At first sight they resemble wasps, but, since they cannot sting, the entomologist need not fear them.

We will now pass on to that section of internal feeders which live on the pith in the stems of plants. Amongst these is *Gortyna flavago*, which may be found feeding in the stems of thistles in May and June. The larvæ are difficult to rear; but the species may be successfully bred, if collected in the pupa state. The pupæ may be found in those stems in which the larvæ last fed. The larvæ of *Nonagria typhæ* feed in May and June within the stems of the various species of Reed-mace *(Typha)*. These plants are often termed Bull-rush. The remarks made about the last species will apply equally to this.

Adapted to their natural habitats, the internal feeders are elongated, and differ very much from ordinary caterpillars. Allied to them are the larvæ of the *Hepialidæ*, and many of those which feed at the roots of grass and other low plants: these are also difficult to rear.

Fresh forms will now continue to appear until the end of September, in which month and the preceding some of the most singular may be obtained. Three new examples are now becoming fine. The very hairy black and orange-coloured caterpillar, which is so often seen running on the road or footpath in sunny weather, is familiar to every one. It changes into the common Tiger-moth *(Arctia*

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caja), and may be found freely on various low plants, on almost any bank, or in gardens. Another is the larva of *Lasiocampa quercus*, which is much larger, less hairy, and more silken looking than that of *Arctia caja*. In colour it is variegated, but brown of various shades prevails. It may be found by day resting principally on thorn and willow; it delights so much in being near the ground that it seldom rests at any elevation greater than a few inches up the stem of any plant or shrub; it also occurs freely on moors. In figure this much resembles the larva of *Lasiocampa rubi* already spoken of, but differs from it in the arrangement of the hair. Both of these require plenty of room, and will thrive best in the large cage. The third differs widely from any we have as yet seen, and changes into the common *Anthrocera filipendulæ*. It is common on many grassy places, and may be found resting on tall stems of plants and sometimes on walls, but so much resembles in colour the surrounding herbage, that generally it is difficult to distinguish. The cocoon is not less curious, and may be found much more readily: it is bright yellow and is attached to a blade of grass, a twig, a wall, &c., and may be frequently found in profusion. If the cocoons are collected, they must not be torn, but, where practicable, whatever they are attached to must be cut off below and taken with them. For a few days before the perfect insects emerge from the pupæ a curious buzzing noise proceeds from the cocoons.

The willows may now be again frequented for the larvæ of *Liparis salicis* and *Tethea subtusa*. These are in the habit of constructing habitations for themselves by uniting two or more leaves with silken threads. The former do not invariably do so, but as they are conspicuous they may be easily found. The latter are more retired, and are, therefore, found with more difficulty. Both also occur on poplar. Two or three singular larvæ of *Geo-*

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metræ may now be found on low plants: so far for May.

June and July may be associated, since the operations of each are similar.

The sand-hills are the great nursery of *Lasiocampa trifolii*, and may, therefore, be frequented early in June for the larvæ of this species. The prevailing colour of these is yellow, and they rest by day upon the ground. The moss on some parts of the hills is becoming yellow through want of moisture, and as it is the colour of the larvæ, it often effectually prevents their being seen. Sometimes, also, they are partially concealed by dead and prostrate stems of plants, so that they are difficult to find; the practised eye of an entomologist bent upon his object will, nevertheless, find plenty.

There are many larvæ on the trees and bushes now, which are nearly, if not quite, at their growth, and these, if wanted, must be at once obtained. The caterpillars of the autumn and spring moths are those principally spoken of. All kinds of trees may be now searched, and much trouble may be avoided by noticing where the leaves are freshly eaten: and such places may be examined by beating and catching in the net or umbrella, shaking out the refuse from time to time. In beating for caterpillars place the open umbrella as much as possible under the branch or bush on which an attack is meditated, and then give the branch or bush two or three sudden and sufficiently heavy blows with a stick; the suddenness of the blows takes the larvæ unawares, and down they fall. Caterpillars of the *Geometræ* and many others often descend by means of silken threads, which would still support and withdraw them from the umbrella when it is taken from under the branch or bush; the entomologist must, therefore, see that none are left suspended. There are some larvæ which closely resemble a bit of dead stick, so that on ex-

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amining the umbrella care should be taken not to reject them.

In some places large, white, dense webs occur frequently on the hedges in June. They are generally apparent to the eye of every one, but are passed with little notice. To the entomologist they are more attractive, as he knows or conjectures that they are the work of some insect. They are, in fact, nests of the beautiful larvæ of *Clisiocampa neustria*. On sunny days they may be seen basking together and often side by side on the surface of the web, and are then conspicuous objects; in cloudy or wet weather, on the contrary, they stay within and are then not seen. In taking these, the branch on which the web is spun should be cut off below and all taken together. Sometimes, however, if the larvæ are on the outside, they will drop on being shaken, and against this the entomologist must guard. Those thrive well in the large cage. A little later in the season the caterpillars of *Eriogaster lanestris* occur gregariously in similar situations and webs; they are also somewhat similar in their habits.

To forget and neglect those which have already gone into pupa would be throwing away past trouble; and as some may be coming out now into butterflies or moths, it is necessary to have a constant watch on those cages which contain them. When a specimen is newly hatched it has its wings folded up, but as soon as it has gained a suitable position the wings gradually expand; at first they are moist and soft, but they soon stiffen. Specimens must always be allowed to stretch and dry their wings before they are killed, otherwise they are of no use. A good criterion in judging when to kill them is to test their ability to fly: if they can do so well they may be put to death.

August finds us on a ramble to the sandhills in pur-

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suit of the larvæ of the small Elephant Hawk-moth *(Chærocampa porcellus)*. These feed on bedstraw, and rest by day upon the ground, where they must be sought in the neighbourhood of their food. At first sight they have something of a snake-like appearance, and the entomologist hesitates to touch them. He grows bolder, and attempts to take hold of one he has found, but a sign of impatience on the part of the caterpillar causes the fingers to be suddenly withdrawn; he looks at it again and hesitates, at last concludes it is harmless, and secures his prize. With the second and future ones there is no hesitation.

Somewhat similar to these are the larvæ of the Elephant Hawk-moth *(Chærocampa elpenor)*, which are also to be met with now. They feed upon various species of Epilobium, and rest by day upon the stems of these plants or upon others near them. They are conspicuous, and are, therefore, easily found. To succeed in rearing them, the cage in which they are put must be kept damp, in order to resemble their natural localities, the marshy places in which their food plants grow.

At this season of the year a portion of an oak or beech tree, and frequently a willow bush, is found to be defoliated. Either something very large, or more probably something very plentiful, has been doing the mischief; and on inspection a full-grown brood of the gregarious and parti-coloured larvæ of *Pygæra bucephala* are found to be the culprits. These will be little trouble, and as they will soon become pupæ they may be put into the large cage. Whilst walking along, a willow twig or two are perhaps noticed to be partially stripped of their leaves; this has not been the work of an idle passer-by, since the stalks are left, and the leaves have evidently been eaten by what proves to be the beautiful and very curious larva of *Cerura vinula*; this may also be found on various

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species of poplar. The singular larvæ of *Cerura bifida* and *C. furcula* also occur now respectively on poplar and willow. All the species in this genus make curious cocoons, and the larvæ have great powers of tenacity in their prolegs. They generally hold very firmly to the twig on which they rest, and unless removed with great care, they are torn and eventually die of the wound.

The same remark may also be made with respect to the very beautiful caterpillars of *Smerinthus ocellatus* and *S. populi*. The former are almost invariably on willows, and the latter sometimes feed on the same bushes, but are more frequently found on poplars. The large and varied caterpillar of the Death's Head Hawk-moth *(Acherontia atropos)* may also be found now feeding on the tops of potatoes. Many very curious and beautiful larvæ of various tribes also occur at this season. Amongst the *Bombyces*, some perhaps of the most notable in the neighbourhood of Liverpool, are those of the genus *Notodonta*. The caterpillars of *Notodonta dictæa* and *N. dictæoides* are very similar in shape and general habits, but differ in colour. Those of the one species feed on poplar, and the other on birch. Whilst at rest they lie at full length upon a twig or on the stalk of a leaf, and are often so difficult to detect, that a practised and keen eye will miss them. The humped larva of *Notodonta dromedarius* is often called the Dromedary, and may be found on alder. Allied to this is the variable and often splendid caterpillar of *Notodonta ziczac*, which may frequently be met with on birch and willow.

All these, as well as many others, may be found now by day, by examining the twigs and underside of leaves, in places where the trees and bushes are freshly eaten. Amongst the *Noctuæ* the larva of *Apatela leporina* is, perhaps, one of the most curious and beautiful. It occurs on birch, is covered with curved hair, and when coiled up

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has much the appearance of a little ball of loose, yellow or pale-brown silk. This, as well as others which occur now, often become pupæ in a piece of decaying wood, which must be supplied to those in captivity.

A portion of a decaying branch is easily obtained and laid upon the moss in the cage destined for them, and it is absolutely necessary for the successful rearing of some. Several singular larvæ of *Geometræ*, which resemble pieces of dead twig, may be found now on various bushes and in various situations. When at rest these so closely resemble the twigs on which they lie, that they are extremely difficult to detect by day. At night they are feeding on the leaves or are in various positions among the green foliage, to which they are a strong contrast, and they may then be easily seen. Sometimes, also, they are hanging from branches, suspended on silken threads, and are then conspicuous. Trees and bushes, as well as low plants, may be thus examined until the fall of the leaf and the commencement of winter.

FOURTEENTH ORDINARY MEETING.

ROYAL INSTITUTION, 17th May, 1858.

DR. INMAN, PRESIDENT, in the Chair.

DYCE DUCKWORTH, Esq., was elected an Ordinary Member.

DR. EDWARDS exhibited some living annelides, nudibranchs, and crustaceans taken at Hilbre Island.

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The Rev. H. H. HIGGINS exhibited a fossil, resembling a Calamite, from Huyton Quarry, and added some stations to the local flora.

The following paper was then read:—

EGYPT AND NUBIA: THEIR CLIMATE, CHARACTER, AND MERITS AS A WINTER RESIDENCE FOR INVALIDS.

BY JOSEPH DICKINSON, M.A., M.D., F.R.S., &c.

COMPELLED by illness to withdraw for a time from the active duties of an arduous profession, I endeavoured to regain health in a climate, brighter, dryer, and milder than our own, and visited in its search many of the most frequented and favoured places of resort both in England and on the continent of Europe, but in vain. I was then induced to try what the climate of Egypt and Nubia could accomplish, and here I found that which I had so long sought for. Having paid considerable attention to the character of this climate and its effect on myself and others, I propose briefly, though I fear very inadequately, to describe them, under the conviction that every trustworthy contribution, however small, will be considered by the scientific inquirer as tending to render more precise and accurate our knowledge of questions of great practical importance, and concerning which many erroneous views and false impressions prevail even among medical men.

The observations made in Egypt and Nubia were conducted by myself and my friend, Frederick Hubbard, Esq., C.E., conjointly. The instruments used were two self-registering and two ordinary thermometers. One of the first was placed outside the boat at the stern, and so situated as to be protected equally from the direct and the reflected rays of the sun, and from currents of air.

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The other self-registering thermometer was placed in a small dressing-room of the boat from which the sun was excluded, but the air freely admitted day and night. The other two thermometers were also protected as far as possible in the same manner. But, I believe, the temperature indicated by the thermometer is of necessity really, both by day and by night, above that of the air on the river. The walls of the boat radiate during the night some portion of the heat absorbed during the bright sunshine of the previous day, and thus, despite every precaution affect the thermometric results. These results were compared three times daily, and every precaution taken to prevent error and ensure accuracy. The importance of attending to these minute particulars cannot be over-estimated, and to its neglect may fairly be ascribed the discordant statements made by different observers.

My own observations in the Desert and Syria were too much interrupted and irregular to be of any scientific value, and I, therefore, gladly avail myself of the table kindly furnished me by my friend Mr. Hubbard, whose attainments in physical science are of the highest order. He had no self-registering thermometer, but took observations with an ordinary instrument with sufficient frequency to give the extremes of temperature with a close approximation to accuracy.

The table for Upper Egypt and Nubia is intended to exhibit at one view the daily maxima and minima of temperature (according to Fahrenheit's scale), the mean of the monthly maxima and minima, the monthly mean and the average range; the force and direction of the wind, the state of the weather with regard to clearness, haziness, dryness, fog, &c. The temperature in the sun is also given as compared with that in the shade, and that of the water of the Nile on the same day and in the same

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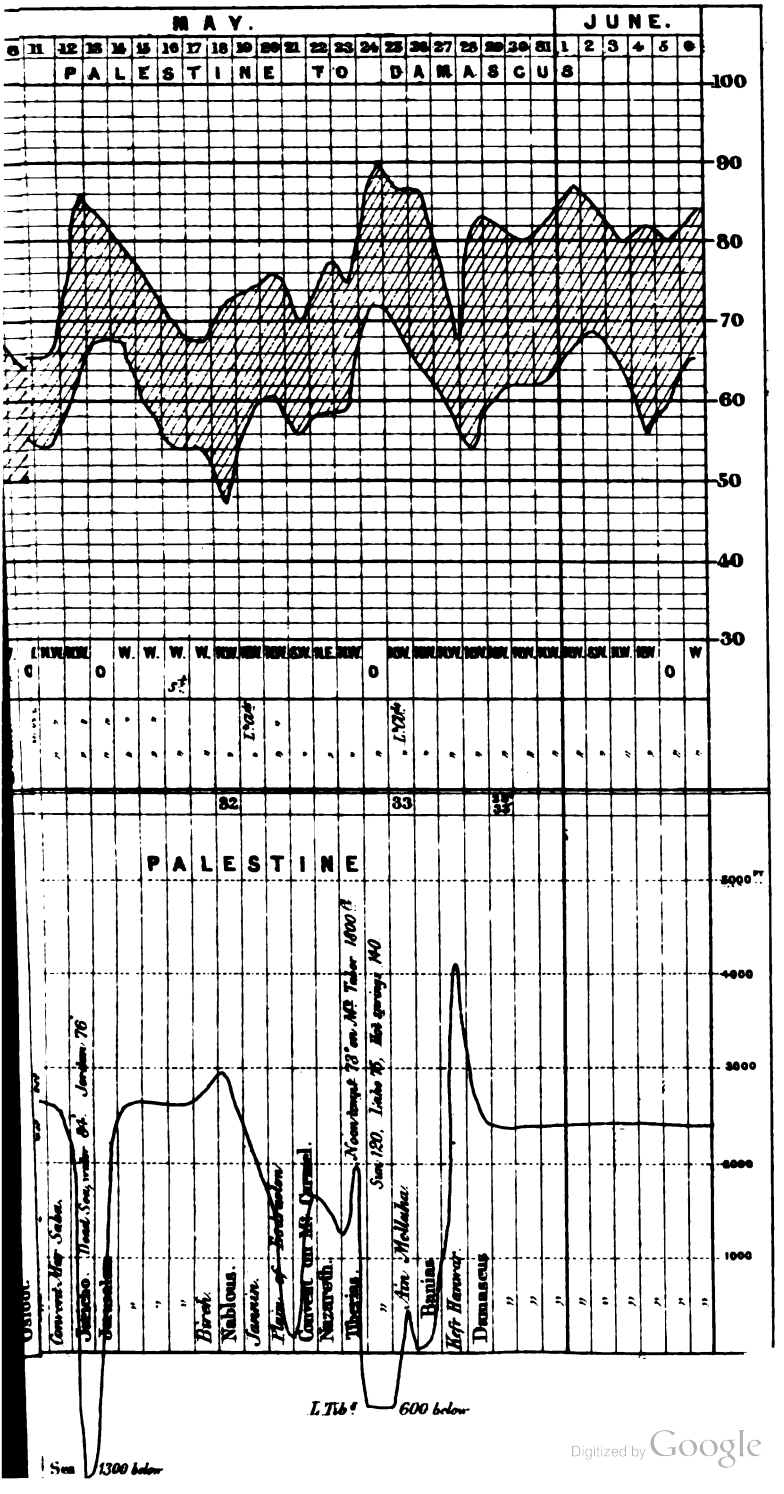

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spot, with such other particulars as are calculated to more fully exhibit the character of the climate and country through which we passed.

To make the latter part of the table (*i.e.* through Arabia and Palestine to Damascus) of use, the elevations above the sea-level have been added in a profile. These are only approximate, but not very wide of the truth. From them the temperature may, if desirable, be reduced to those at the sea-level. They are, however, probably, more interesting as they stand. It may be observed how regularly the temperatures fall as the profile rises, and *vice versa*, modified a little by the winds. The temperatures of the Jordan, Dead Sea, Red Sea, &c., are also given.

The passage from Malta to Alexandria generally occupies about seventy to eighty hours. The French Steamer *Borysthene* conveyed us in a little less time.

We had as fellow passengers the representatives of not less than twelve nations from the four quarters of the globe. Few can conceive the striking difference which in almost everything manifests itself between this bustling port and those of Europe. Having passed through the form of examination of luggage at the custom-house, and the reality of most vexatious importunities and annoyances from porters, donkey-men, and boatmen, we soon found ourselves quartered at our hotel in the square of the Frank quarter. The Peninsular and Oriental Hotel is well-kept, and reasonable in its charges—about ten shillings a day.

Little need be said here about Alexandria itself. Pliny, who wrote his Natural History A.D. 77, states that it was then a most flourishing city, and that its circumference was fifteen miles. It had a population of 300,000 freemen, and at least as many slaves. One of its streets was four miles in length and one hundred feet wide, and

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the Romans regarded it as second only in magnificence and importance to their own capital. One-fourth of its area was covered with palaces, temples, and public buildings, whilst its harbours were crowded with fleets, laden with the rich products of the East, to be distributed through the various nations of Europe.

Alexandria fell into the hands of the Arabs A.D. 640. Amrou, in his report to the Caliph Omar, states that it then contained four thousand palaces, four thousand baths, four hundred theatres or public buildings, and twelve thousand shops, (Gibbon). Its decadence has been dated from that period. It would appear, however, from the statement of Bishop Arculf, who travelled in Egypt about the end of the seventh century, that the commercial prosperity and political importance of this great city were not then so greatly reduced as we are led by recent historians to believe. Bishop Arculf describes it as "a city famous throughout the whole world. It extends to a great length from east to west, so that he (Arculf), who began to enter the city at nine o'clock in the morning *(horâ tertiâ)* in the month of October, and proceeding through the whole length of the city, hardly reached the other side before dark."

Benjamin of Tudela, in the twelfth century, describes Alexandria as "an extremely strong and handsome city," to which people flocked from all parts of the world to study the Aristotelian philosophy." "The streets are straight, and some," he states, "are of such extent that the eye cannot overlook them at once." "The city," he adds, "is very mercantile and full of bustle, and affords an excellent market to all nations. People from all Christian kingdoms resort to it, and every nation has its own fonticcho (or hostelry) there." Four centuries afterwards our learned and observant countryman, George Sandys, visited Alexandria. After dwelling on its ancient glories,

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he adds, "Such was this Queen of Cities and Metropolis of Africa, but who now hath nothing left her but ruines, and those ill witnesses of her perished beauties, declaring rather that towns as well as men have their ages and destinies." The rude hand of the fanatical and barbarous Mussulman had already done much in the work of destruction, but the discovery of the passage to India round the Cape of Good Hope, by Vasco de Gama, in 1497, completely destroyed the commercial importance of Alexandria, and it remained little more than a mass of ruins until the end of the last, or beginning of the present century, when the gigantic intellect of Napoleon appreciated its immense importance as the Key of the East. At the commencement of the present century Alexandria numbered as inhabitants not more than six thousand souls. They now amount to about eighty thousand, and the progress of recent events would seem to indicate a steadily progressive increase.

In 1845 and 1846 Sir William Pym visited professionally the different lazarettos of the Mediterranean, Adriatic, and Levant, and in the correspondence respecting the Quarantine Laws presented to Parliament, in 1846, we find him stating that, "The towns of Alexandria and Cairo are remarkably clean, and Alexandria in particular is rapidly improving. Orders have been issued for widening streets, pulling down houses, &c." "The health regulations are not confined to the town but extend over all lower Egypt, and particular attention is paid to the Delta, medical men being stationed in every district, &c." Doubtless Mohammed Ali *intended* that these things should be thus as sketched by Sir William, more, I conceive, from the description of others than from his own observations; but this, like many others of the great enterprises of that wonderful man, has proved a miserable failure. It is, indeed, too true, as remarked by a late traveller that,

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"Since the accession of Mohammed Ali, innumerable villages have been deserted, most of the towns and cities have shrunk in their dimensions, the clothes of the people have been exchanged for rags, their food has been deteriorated by many degrees, whole districts have been thrown out of cultivation and are fast becoming a prey to the sands of the desert, and the population has dwindled from three millions to one million and a half, according to the estimate of Sir Gardner Wilkinson." Many will be disposed to agree with Miss Martineau, who visited Alexandria in 1848, and thus writes: "Except in the direction of the small and poor looking town, the area within the new walls appears to contain little but dusty spaces and heaps of rubbish with a few lines of sordid huts and clumps of palms set down in the midst, and a hot cemetery or two with its crumbling tombs. I have seen many desolate looking places in one country or another, but there is nothing like Alexandria as seen from a height, for utter dreariness." "Nobody comes back to Alexandria that can help it."

It may be here incidently remarked that according to the most authentic records, Egypt has undergone a gradual decrease, both in the number and size of its towns and in its population. Making every allowance for Greek and Roman exaggeration the fact seems undoubted. According to Herodotus there were in the time of Amasis, (about 525 to 570 years before Christ, and the era of Thespis, Pythagoras, and Æsop), twenty thousand inhabited towns, and Diodorus says that eighteen thousand were entered on the register. This historian also affirms that in the Pharaonic era the population amounted to seven millions, and that it was not less in his own time.

In the time of Sesostris (Remeses ii.), before Christ 1355, the population would appear to be about six millions. Two centuries ago it was four millions; at the commence-

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ment of the present century it had dwindled down to two-and-a-half millions, and now Sir Gardner Wilkinson, a most competent authority, estimates the population at one-and-a-half million. Cheapness of food, simple diet, steady industry, combined with a paternal government, and a most salubrious climate to afford universally health and longevity to the children of the Egyptian women, who were ever celebrated for their fecundity, yielding occasionally, according to Aristotle, five children, or even, according to Pliny and Strabo, and not so rarely as to make it a prodigy, seven children at a birth!

It is unnecessary to dwell long on the climate of Alexandria, as nearly all that is needed on the subject has been already laid before the public in the writings of more competent and experienced observers.

It seems, however, sufficiently evident that Alexandria is not a place which an invalid from this country would willingly select for a winter's residence, for, though during the summer rain rarely if ever falls, it does so frequently and abundantly in winter, and the temperature then is also low and unequal. Even during the period when the sky is clear and no rain falls, the air is saturated with moisture and occasions in the invalid a feeling of languor and oppression. Besides, the lake Mareotis, with its mixture of fresh and sea waters, and the numerous ancient underground cisterns, sadly tend to render Alexandria the abode of fever, ophthalmia, and dysentry. It is calculated, from the returns of the last twenty years, that one-tenth of the entire population die off annually from fever alone. Dysentry here, as throughout the Delta, is very destructive at certain seasons, and ophthalmia in its mild and severe forms is met with in every direction. Dyspepsia is very prevalent among the European residents, and the sufferers from bronchitis are numerous. The cholera has also had in its visitations a larger share of victims here than in most

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other towns. The records of the plague shew that it makes its appearance in Alexandria many days earlier than in the interior. "In March, 1835, 4250 persons died of plague, besides many whose deaths were not recorded, out of a population not exceeding 30,000. Two-and-twenty years previous to this, (namely, in 1813), 7000 persons are said to have died of plague out of a population then not more than 12,000." The plague is extremely rare in Upper Egypt and Nubia. The writer from whom the above remarks are quoted, adds—"The climate of Alexandria is, on the whole, salubrious, and was considered eminently so by the ancients;" and, indeed, this was the opinion, it would appear, of Diodorus, Celsus, Strabo, Quintus Curtius, and other ancient writers. As a place of vast commercial importance, Alexandria must be ranked very high, but its ancient salubrity, as well as its grandeur, have disappeared.* At the present time poverty, degradation, filth, and disease combine to finish the picture which the swarms of mosquittoes, the small but most irritating sandfly, the midnight Arab funeral wail, the early crowing of innumerable cocks, the incessant braying of donkeys, the howling and growling of miserable, starving dogs, might otherwise have left incomplete.

Leaving Alexandria at nine a.m., travellers pass, in comfortable carriages and at a moderate charge, by a one-lined railway, in about six hours to Cairo, a distance of one hundred and thirty-two miles. The railway traverses the fertile plain of the Delta, abounding in rice, cotton, wheat, lentils, &c., and exhibiting at intervals mounds covered with the wretched mud-built villages of the Fellahs, with one or two towns of some interest. At one of the stations, Kafr-Sejat, the train stops for a short time, nominally in order that the passengers may take some refreshment and rest, but in reality that the viceroy,

* "Heu quantum Niobe, Niobe distabat ab illa!"

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(to whom the railway, &c., belong,) may victimise any unwary traveller induced to partake of the scanty fare offered without first ascertaining the charge. A very moderate breakfast or luncheon will then cost him five or six shillings, and if he add wine to it, he must pay in proportion. The charge for the same at Alexandria or Cairo would be about one-fourth of the sum. As he approaches Cairo the interest considerably increases. For the first time, probably, the European traveller's eyes are greeted with a sight of those mighty pyramids on which so many centuries ago Abraham, Joseph, and Moses, had so frequently gazed; and soon after Heliopolis, the On of the sacred scriptures, comes into view with its lofty and most ancient obelisk. Here, Poti-pherah, the father-in-law of Joseph, exercised his high office of prince-priest, and from its school Solon, Thales, Plato, and others, derived much of that learning and science which was afterwards to give impulse to the more prolific and lofty mind of Greece. The immediate impression produced by these venerable structures has not passed away before Cairo or Masr el Kahira, (the victorious,) comes into sight, with all its oriental grandeur. The numerous, and much varied buildings, terraced, white and glistening, seem spread out on a carpet of the richest velvet verdure, with the lofty and most graceful minarets rising up in every direction—the whole skirted by gardens abounding in lemon, orange, citron, and other fragrant trees—with groves of lofty palms, and avenues of acacias and sycamores. Overtopping all, at the extremity of the Mokattam range of mountains, stands the celebrated citadel, with the palace and mosque of the viceroy, the whole exhibiting "a city the like of which" remarks Clot-Bey, "no where else exists, a city stamped with a genuine Arab impress, a true city of the Arabian nights." "Such is the city, the fairest in Turkie, yet differing from what it was, as from

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a body being young and healthful, doth the same grown old and wasted with diseases."—(Geo. Sandys, 1610.)

Cairo has of late years been much resorted to by European invalids for a winter's residence, and in many points of view it possesses very decided advantages over most places in Europe. Few places are more amusing and attractive to the European visitor, nor are its attractions very soon or easily exhausted. The numerous Saracenic palaces and mosques, with their beautiful minarets, splendid domes, and richly ornamented porches and cornices, the lofty flat-roofed houses, with their curious projecting and iron-barred, or quaintly carved windows, the fountains with their luxuriant carving, and Arabic inscriptions, the bazaars stored with the various productions of the East, the baths, the citadel, with its extensive and most interesting prospects, the narrow and crooked streets affording shelter alike from the scorching rays of the summer's sun and the winter's blast, and presenting a wondrous architecture without symmetry, and yet strangely harmonious and pleasing, the strange commingling of costumes and nationalities of the past and present, the Christian and the Moslem. These, and other sources of instructive gratification, are met with without risk, and without fatigue. The neighbourhood, too, abounds in objects of interest. The hotels now, especially those in the Uzbekieh, or Great Square are good and moderately cheap—from eight to ten shillings per day;—yet the Christian philanthropist is constantly reminded, that in this "Queen of Arabian cities"—"this epitome of the whole Eastern world," there flourish, as in a hot-bed, all those vices which have been the bane of the vast, but short-lived despotisms of the East. "Converse with whomsoever you please, you will quickly discover, amid the charms of the most dazzling and fascinating manners, infernal ideas and principles peeping forth, like the asp and the scorpion, among flowers.

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Corruption, if not universal, is so general that it seems to exhibit itself everywhere. The very tombs, when a little secluded, are not free from pollution." So wrote one fully competent to judge correctly, and Miss Martineau thus adds her testimony:—"There are few gayer things in life for one who chooses to be gay, than a visit to Cairo. The stranger must use a few precautions against the disturbance of gaity; and then he may surrender himself to the most wonderful and romantic dream that can ever meet his waking senses." But, in addition to other precautions, "he must shake off any considerate humanity that may hang about him, and avoid inquiring what lies beneath what he sees, or thinking of any people but those he meets in the bazaars." Thus "the stranger in Cairo may have a short season of transport, if he will only take up with the show of things and forget the roots. The mere spectacle of the streets I relished more and more to the last; as for the rest I could not keep my heart and mind in abeyance for many days, and before I left, I felt that there is hardly a spot in what I have seen of the countries of the world where I would not rather live than in Cairo."

Besides these ethical considerations, there are some serious drawbacks in the climate which render it desirable for the invalid not to spend the whole winter in Cairo, but to pass up the river to the drier and more healthy region of Upper Egypt and Nubia. The winds, occasionally very strong, which prevail here from the end of summer until April, are mostly from the north, and bring with them after sunset heavy and cold fogs, which render the nights chilly and dangerous to those exposed to them, without being sufficiently protected by warm woollen clothing. The lowering of the temperature after sunset is often very sudden, and generally great, continuing until sunrise next day. Nearly all who have spent much time in Cairo, will agree in the truthfulness of Sir James Clarke's

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remarks,—"The wind is sometimes unpleasantly high, and the mid-day sun oppressively hot; the temperature during the night also often falls considerably." "This great difference between the temperature of the night and that of the day forms a remarkable feature, and at the same time the greatest defect in the climate of Egypt." This may be said of the whole of Egypt below Thebes, and with much force as regards Cairo and the region between it and Alexandria, but it will be seen by a reference to the large table that the temperature very rarely above Thebes, and in Nubia still more rarely, sinks below 50° Fah.

Tables of temperature for Cairo have been given by Dr. Abbott, Niebuhr, and others, in Mr. Rhind's useful little volume, and by others—but the majority are certainly imperfect as regards the night temperature. This is strictly the case in Dr. Barclay's tables, published in the *Medical and Surgical Journal*, Oct. 1854, and quoted in full, with the highest eulogium, by Dr. Copland, in his able Medical Dictionary. Dr. Barclay must have omitted to put his thermometer out of the window. He gives the lowest point at night (December and January,) at 57° Fah., and the highest by day (December and January,) at 64° Fah.; the greatest diurnal range being only 7° F. Indeed the greatest diurnal range which he gives between December 25th and March 7th, is only 8° F., and the greatest diurnal range during the whole winter and spring is only 14 degrees. If his tables afforded even an approximation to the truth, the principal objections to the climate of Cairo would fall to the ground, but the whole of his tables for Egypt are so much at variance with the observations of nearly all on whom dependance can be placed, that I cannot but suspect that some grave error has crept into them.

It is well known to residents at Cairo, that the ther-

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mometer frequently sinks there below the freezing point; for as Mr. Traill, many years Superintendent of the garden at Rhoda, informed Dr. Bromfield, "hoar frost is no uncommon thing here in the winter months," and he has seen ice, thin of course, formed on pools in the desert. Others have informed me, that they have observed the same thing, and Mr. Headland, the Superintendent of the sugar factory at Rhoda, nearly two degrees above Cairo, states that the canes are occasionally much injured in that latitude, 20°N., and that in January sharp hoar frosts are not unfrequent, ice having been formed last winter there one-fourth of an inch in thickness. Even at Esne, latitude 25°N., we observed the thermometer to sink to 37° F. on the night of the 20th of February, 1857. This, however, was during the prevalence of a strong northerly wind, which continued for three days and nights so forcibly, as to render every effort to move down the river, by rowing, nearly altogether futile. But in Cairo, I found in December, 1856, the temperature more than once below the freezing point. On the last day of that month, the temperature was, in the sun maximum, 110° F., in the shade, maximum, 70° F.; and the lowest temperature at night, 46° F., there being a slight southerly wind.

During the winter, for the most part, the sky at Cairo is clear, the air in the day dry, and the mid-day heat pleasantly tempered by the northwinds; whilst the night fogs nearly always disappear soon after sunrise. It has been calculated by Mr. Rhind that, "taking an average of six years, at various intervals between 1762, and 1856, from the middle of November until the middle of April, rain appears on about fifteen days and nights, chiefly in January and February; but on the majority of these, the fall is confined to a few drops, or some slight showers." On the whole, the climate of Cairo may be safely recommended

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as salubrious, and well adapted for a winter's residence for a large class of invalids, who are unable, or unwilling to avail themselves of the superior climate of the Thebaid and Nubia. Towards the end of April, sometimes sooner, and during May and early in June, the Khamseen, (or fifty days wind), a south or south-east wind, with its parching breath and clouds of impalpable dust prevails, and all dews cease. Before this wind, so prejudicial to all animated nature, sets in, invalids, Europeans especially, should leave the country, either for Syria (the strong by the desert), or for the warmer parts of Europe, such as Malaga, or Southern Italy.

In the following remarks on climate reference is made principally to that part of the Nile Valley which extends from the ancient Hermopolis Magna, in lat. 28°N., to Syene (Asouan), known as Upper Egypt Proper; or the Thebaid, and to Nubia, but they will likewise hold good with some modifications for Middle Egypt, or that part of the Valley which is above the Delta and below Hermopolis, and consequently including Cairo and its neighbourhood. The climate of the Delta differs essentially from the former as it does also in its flora and fauna. Rain falls abundantly at certain seasons in the Delta, and its meteorological features are akin to those of the neighbouring coastlands of Africa and the Mediterranean, partaking of all their defects as a place of residence for the invalid, whilst in Upper Egypt and Nubia, as will be shewn afterwards, rain is very rarely seen, and the difference of its flora and fauna are manifested in the dhoum palm, the river plants, the crocodile, the hyena, the jackal, &c.

Probably no known climate can boast to the same extent as that of the Thebaid and Nubia of the union of a cloudless bright sky, a pure warm atmosphere, combined with unequalled freedom from moisture, and great steadiness of temperature, as from day to day. Sir James Clarke writes thus—"I believe there is to be found in no

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part of Europe a climate possessing these qualities (warmth and dryness) in so eminent a degree during the winter, as that of Upper Egypt. At this season, indeed, the Egyptian climate, in point of warmth, dryness, and steadiness of temperature, is superior to any noticed in the preceding pages (viz. those relating to Europe,) and in regard to the two first named qualities, it surpasses every other climate not within the tropics," mentioned in his work. The great defect of the climate here, as lower down the Nile valley, is the great difference of temperature between day and night. Happily, however, this is a defect which can be guarded against by very simple precautions. In this respect it contrasts unfavourably with Madeira, as it also does in regard to the difference of temperature between one season and another, and the daily successive range. This remark will apply, in a minor degree, to some other places. The climate of Egypt, however, has, in its union of good qualities, independent of its dryness, more than counterbalancing recommendations.

Lepsius thus writes from Thebes on the 13th October, 1843, and his remarks will be just for the greater part of the winter in the Thebaid and Nubia:—

"No one ever inquires here about the weather, for one day is exactly like the other—serene, clear, and hitherto not too hot. We have no morning or evening red, as there are neither clouds nor vapours; but the first ray of the morning calls forth a cloud of colours in the bare and rugged limestone mountains closing in around us, and in the brownish glittering desert, contrasted with the black or green-clothed lower plain, such as is never seen in northern countries. There is scarcely any twilight, as the sun sinks down at once. The separation of night and day is just as sudden as that between meadow and desert—one step, one moment, divides the one from the other.

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The sombre brilliancy of the moon and starlight nights is so much the more refreshing to the eye which has been dazzled by the ocean-light of day. The air is so pure and dry, that except in the immediate vicinity of the river, in spite of the sudden change at sunset, there is no fall of dew. We have almost forgotten what rain is, for it is above six months since it last rained with us in Sakara. A few days ago we rejoiced, when towards evening we discovered some light clouds in the sky in the south-west, which reminded us of Europe. Nevertheless, we do not want coolness even in the day-time, for a light wind is almost always blowing, which does not allow the heat to become too oppressive. Added to this, the Nile water is pleasant to the taste, and may be enjoyed in great abundance without any detriment."

The grand peculiarity and excellence of the climate of the Thebaid and Nubia is its dryness, which is evidenced by many remarkable facts. The rock temples and tombs exhibit, in their primeval freshness, paintings above three thousand years old, and linen, fruits, meats, bread, and other materials quickly perishable in moist climates, are here preserved as if unaffected by decay, and affording convincing evidence that, year after year, the climate retains this characteristic feature. I never met with a single conferva, lichen, or moss throughout the whole Thebaid or Nubia, though most diligently sought for; and the difficulty of bringing fresh specimens of plants uninjured to the boat, for preservation in the herbarium, was exceedingly great, as they became so soon dessicated and shrivelled up.

The air of the desert is even drier than that of the valley of the Upper Nile, and is remarkably buoyant, refreshing, and invigorating, though here also there is a very marked difference between the temperature of day and night, as we found by experience, and as may be seen

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by a reference to the table. In some parts of the desert the temperature from day to day is very equable, and the diurnal range not very great, but in this respect the desert localities greatly differ. Rhind states that his observations corroborate, with regard to dryness, those of Dr. Barclay, who found, "taking zero to represent summer-drought in England, his hygrometer shew a mean of 7·5 degrees of dryness when sailing between Thebes and Assouan, from the 17th to the 23rd of January, while the mean was 12·2 in a tomb at Geezeh, for a corresponding number of days, from the 13th to the 19th of March, the temperature at both periods being very nearly identical, and the same bright, cloudless weather prevailing."

Rain is nearly unknown in Nubia, and is also very rare in Upper Egypt. During nearly three months spent on the Nile in 1857 we had only three showery days, and on two of these the showers were only very slight and short.

A friend, just returned from Egypt, and who has furnished me with some very valuable information regarding the weather on the Nile during the last winter, 1857-58, informs me that during more than three months they had only one shower (at Edfoo on the 5th February). Even the above appears to be above the average number of wet days, if we are to credit the statements of travellers. Pococke "had been told that there, in eight years, it had been known to rain but twice very hard for half an hour." Satisfactory evidence, however, exists, both on the Mokattam and Libyan hills, that very heavy rains do occasionally fall throughout Upper Egypt, for they exhibit numerous deep water-courses with well-marked traces of the force and rapidity of the torrents. On the 17th of January, near Girgeh, lat. 26½°N., there was in the evening much lightning and some thunder, with

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occasionally a squally wind, occasioning some danger to our boats. During the night there was a very heavy shower, and on the following day two more such. Lepsius writes, "At Assouan we were obliged to change our boat on account of the cataracts, and for the first time for six months past, or longer, we had the home enjoyment of heavy rain and a violent thunderstorm, which gathered on the farther side of the cataracts, crossed with a mighty force the granite girdle, and then, amidst the most violent explosions, rolled down the valley as far as Cairo, and (as we have since heard) covered it with floods of water, such as had been scarcely remembered before. So we may say with Strabo and Champollion, 'In our time it rained in Upper Egypt.' Rain is, indeed, so rare here that our guards never remembered to have beheld such a spectacle."

Lightning and thunder, especially the latter, are, however, extremely rare in Upper Egypt, and it is mentioned by Aymé (*Description d'Egypt I.* 135) that, during two years he heard only a single clap of thunder, and that so faint as to escape the notice of several persons around him.

A clear sky and high daily temperature of the air are favourable to the development of heavy dews, and are consequently much seen in middle and lower Egypt, especially when the north or west winds blow, as they come from the Mediterranean, surcharged with moisture. On the contrary, dew is nearly altogether absent when the winds blow from the south or the east, as the hot and arid sands of the desert completely desiccate them before they reach the Nile valley. There is also little or no dew in Nubia, except on the river, and that is so slight as scarcely ever to leave any perceptible moisture on the boat. Volney has stated that dews are most frequent in Egypt during the summer, but this is altogether incorrect,

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for very numerous carefully made observations have demonstrated the contrary.

It is an interesting fact that the temperature of the Nile water was never found to be lower than 56° Fah., generally about 60° Fah., the difference being due to the sandbanks and depth of current, whilst the surrounding atmosphere was often from ten to fifteen degrees lower,—the mean of the minima being 52½° F., and if we deduct the bright night temperature of Nubia, which, on the 8th February, 1857, at Derr reached 70° F,, the mean of the minima would be below 50° F. Mr. Spencer Wells found the mean minima in a voyage up the Nile, in 1849-50, to be only 45° Fah., and I am informed that the mean of the minima of the last winter (1857-58,) was still lower.

All writers of any authority agree in the ancient salubrity of Egypt, and the great longevity of its inhabitants, though they may differ as to the causes. A recent writer, however, (J. A. St. John, in his *Egypt and Nubia*,) states that "it was observed by the ancients, that of all mankind the Egyptians were the shortest lived." The very contrary is the fact. The unanimous voice of antiquity told it, but it is only necessary to cite a few authors. Prosper Alpinus, a most competent authority, has devoted a whole chapter to this subject in his *Medicina Egyptica*. He there distinctly states, that the Egyptians lived to a much more advanced age than any other nation;—"very many of them lived to more than a hundred years, and for the most part, the life allotted to them is of ninety years duration." He attributes this longevity to the climate and their mode of living. They were very temperate both in their food and drink, using for the latter little more than the Nile water, and contrasting very strikingly and favourably in both these particulars with Europeans, and especially Britons, Gauls, Dutch, Germans, and Poles, who drank wine and beer freely, and used large quantities

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of animal food, whilst the Egyptians drank water principally, and used a milk and vegetable diet, eating very sparingly of animal food.

Herodotus, who flourished about 550 B.C., thus writes. Lib. 2, c. 77. "They (the Egyptians) purge themselves every month, three days successively, seeking to preserve health by emetics and clysters, for they suppose that all diseases to which men are subject proceed from the food they use. And, indeed, in other respects the Egyptians, next to the Libyans, are the most healthy people in the world, as I think, on account of the seasons." He then describes their mode of living, and states that "they use wine made of barley, for they have no vines in that country." He then adds the precautions used to avoid excess, precautions which were not always effectual even with the fairer sex, as may be seen in the numerous paintings in the tombs, &c. At Beni Hassan, the effects of too much wine on men are fully represented, and at Thebes on Egyptian ladies. On the whole, however, the ancient Egyptians were remarkably temperate, both in food and drink, and to this cause, with salubrious climate, Prosper Alpinus, as will be shewn afterwards, mainly attributes their great longevity.

This statement of Herodotus, that "that they have no vines in that country" (Egypt), can only apply, as has been judiciously observed by the Rev. Dawson Turner, in his admirable "*Notes on Herodotus*," to that part of Egypt marked out for the cultivation of corn. "For though the juice of the grape came far more into use after the reign of Psammetichus, yet it is evident that the ancient Egyptians were neither unacquainted with the vine, nor with the wine made from it, as this passage and Book II. c.60. (and more wine is consumed at this festival, *i.e.* that of Badista, than in all the rest of the year,) shew, as well as the testimonials of Strabo and Diod, sic. 1. 36." That

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the vine was known in Egypt at a very early time is manifest from Numbers xx. 5. And also the dream of the chief butler, in Genesis xl. 9-11. Dried grapes were also placed on the body of the bullock, (cp. II. 40.) and Osiris is identified by Herodotus, with Bacchus, the known inventor of wine.

In addition to these authorities, quoted by Mr. Turner, I may add that of Lucan, Lib. I. 8.

"Gemmæque capaces
Excessere merum sed non Mareotidis uvæ
Nobile, sed paucis senium cui contulit annis,"

and that of Pliny, Book x. iv, ch. 9., who mentions as growing in Egypt "Three varieties of grape, of the very highest quality known as the thasian, the æthalus, and the pence.

Whilst, indeed, the traveller in Egypt now never meets with vines, except in the Fyoom, for they have ceased to exist since its conquest by the Mahomedans, who are by their law forbidden to use wine, yet he constantly finds in the temples and tombs ample evidence in their paintings and sculptures, that the ancient Egyptians were well acquainted, from the very earliest periods, with the culture and use of the vine. At Thebes and Beni Hassan, may be seen, on their walls, the vineyard, the vines trained in bowers, the plucking of the grapes, the baskets containing them, young kids browsing on the vines, the wine-press and wine making, and the amphoræ containing the wine. Besides grape wine, and wine made from barley or beer, the Egyptians, as well as the Babylonians, drank palm wine. On this subject, as indeed on all others connected with ancient Egypt, I would refer the reader to the valuable works of Sir Gardner Wilkinson. His "*Handbook for Egypt*," published by Murray, is indispensable to travellers, and far surpasses all its rivals and imitators.

To return from this digression, it would clearly appear, from the inscriptions on the tombs, and similar sources of

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information, that the inhabitants of the Nile valley really did enjoy a very remarkable longevity. Morton, in his "*Crania Egyptiaca*," remarks, that amongst one hundred skulls, taken at random, he calculated that there were two of from sixty to seventy years, three of from seventy to eighty years, and two of from eighty to ninety years old; a proportion far greater than is to be met with amongst European nations, where scarcely two persons aged ninety years, are found amongst one thousand. It has also been inferred, from observations made in the tombs, and from the comparative scarcity of mummies of children, that owing to the care bestowed on infants, and the genial influence of the climate, the mortality amongst them was very slight. The mortality amongst children in Egypt is now, however, exceedingly great, nor does it remarkably diminish until after puberty. This does not arise principally from epidemics, such as smallpox, (which do, however, sweep off vast numbers,) but mainly from filth, neglect, and mismanagement.

The sight of the children is one well calculated to excite pity and sorrow. Their heads are scurfy and covered with dirt, their bellies are large and swollen, their limbs are ricketty and emaciated. They are more than half naked, whilst their eyes, secreting a thick muco-purulent matter, are, as well as their mouths, constantly covered with flies, which they have not the power, nor their wretched mothers the disposition, to drive away. Their countenances, instead of the pleasing rotundity and cheerful freshness of childhood, exhibit only the expresive marks of pain and disease, and are sharp, sunk, and unsightly.

The women themselves are not generally much better favoured than their youthful offspring. I am now speaking, not of the Nubian women, who, when young, are remarkably well formed, graceful, and for the most part,

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very pretty; but of the lower classes of Egyptian women, whose long single wretched garment, generally open in front above the waist, ill conceals their unsightly forms. Nor do the pendulous bosoms, the sunken eyes, the wrinkled and insipid face, with other indications of premature decay of mind and body, tend to render them more attractive, any more than the habit both women and girls have, of anxiously covering their faces, at the expense of leaving much of the rest of the body uncovered. Miss Martineau states that she found "the people throughout the country sleek, well-fed, and cheerful," nor was "she sure that she saw an ill-fed person in all Egypt." Unhappily her experience in this matter is nearly, if not quite, unique.

George Sandys gives a most graphic description of the people as he found them at the beginning of the seventeenth century, and in many particulars, if not all, it would obtain at the present time. The demoralizing influence, and most baneful effects of the Mahomedan imposture had then, as now, become patent. After describing "the Egyptians of the middle times," who "were a people degenerating from the worth of their ancestors; prone to invocations, devoted to luxury, cowardly, cruel; naturally addicted to scoffe and to cavill, detracting from whatsoever was gracious and eminent," he says "The countrey people doe follow husbandry. They are not long in dressing themselves, being onely wrapt in a russett mantle: nor have the women a better coverture: hiding their faces with beastly clouts, having holes for their eyes; which little is too much to see and abstain from loathing. A people breathes not more savage and nasty; crusted with dirt, and stinking of smoke, by reason of their fuell, and their houses, which have no chimneys. Some of them dwell under beggarly tents, and those esteemed of the old inhabitants." Yet, "the

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beggars, by singing, both get relief, and comfort their poverty; playing withall upon drums which are fashioned like sives."

The ancient salubrity of Egypt has been attributed, by a recent writer, in a great degree, to the general prosperity of the people, the canals of Sesostris, and the elevation of the dwellings or mounds, but above all to the universal practise of embalmment. And it has been asserted that this salubrity ceased with the practice of embalmment, which was totally abolished about the middle of the fourth century, (356 A.D.) It is contended by the same writer, that in Lower Egypt, disease, more especially the plague, is sown and preserved by the mode of sepulture—that "the living are poisoned by the emanations from the dead." "A porous level soil, filled with dead bodies, penetrated universally by moisture during the overflowing of the Nile, is after the subsidence of the waters, heated by a burning sun, and a vast cemetery, in the language of M. Pariset, is converted into a true distillery of dead bodies." Doubtless this may be a prolific source of disease, and more particularly of the plague; but far more may be attributed to the great moral and physical degradation of the people, to their insufficient and unwholesome food, to their low, ill-ventilated, over-crowded wretched huts, and the agency of animal and vegetable matters, putrefying in an alluvial or marshy soil, like that of the Delta. Moral, physical, and political degradation, poverty, famine, and filth, must always, and everywhere, render their possessors fitting subjects for disease and death. Whatever may be the case now in Lower and Middle Egypt, it is evident from the concurrent testimony of authors, that for a period of nearly a thousand years, Egypt was free from all pestilential epidemics—that is, during its occupation by the Persians (194 years), that by Alexander and his suc-

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cessors, the Ptolmies (301 years), and that by the Romans, until the great plague in the time of Justinian, A.D. 542, which devastated, as a fearful epidemic scourge, the whole of Egypt, Turkey and Europe, to the verge of the Atlantic, sweeping away, according to Gibbon, a hundred millions of people. True, the plague has been clearly shewn from the writings of Rufus, of Ephesus, to have its primary origin in Egypt, and that this was its native seat. It is also now known to have existed there for, at least, two centuries before Christ; but then it was only known as a rare and sporadic disease. It is now never seen in Upper Egypt and Nubia, and need be no source of alarm to the European invalid. Besides, no such person would visit the country when the plague was known to prevail; and "it is seldom that a case of plague presents itself in Alexandria during September and following months, until February, and then only at intervals of several years. Cairo is quite safe from the beginning of July, to the end of March."

Early marriages also, doubtless, somewhat contribute to the great mortality of the young, as also do the numerous intermarriages between near relatives. It is no unusual thing for a girl of twelve years of age to be married and a mother, and become a wrinkled hag at forty or forty-five years of age.

The males, however, having arrived at maturity, seem remarkably free from disease, and are often muscular and well formed, though not in general long-lived, as might be expected from their habits, &c. It is therefore "rather staggering," says Rhind, and few will here dissent from him, "to find Father Alvarez declaring in the early part of the seventeenth century, that he had seen in Ethiopia powerful men at one-hundred and fifty years of age, and that in Egypt there were more old men than in any other country on the face of the earth."

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Neither time nor space will allow of our entering into a detailed account of the diseases prevalent in Egypt. This has been done already by Clot Bey in his "*Apercu Général sur l'Egypte*", and M. Pruner in his "Topographia Médicale de Caire." It may be sufficient to refer the majority of these diseases either to the miasmata occasioned by the stagnant pools of lower Egypt, or left by the inundations of the Nile; to the great heat (at certain seasons) by day, and comparative cold by night; to the bright sun, and fine sand-dust diffused through the air; and to the filthiness and misery of the people, or to the combination of these agents.

Dysentry and ophthalmia are the diseases most prevalent in Egypt, and are probably mainly due to exposure to draughts of cold air when the body is heated. They are in general much more easily cured now than formerly; probably because the diseases are of a milder type, and the treatment is better understood. The formidable ophthalmia which committed such fearful havoc in the French and British armies at the commencement of this century is now nearly altogether unknown; and although the proportion of natives (Fellaheen) labouring under the loss of one or both eyes, or of the disease in some of its forms is still fearfully great, yet doubtless this is owing to the neglect of proper treatment, which is, when judiciously used, attended with almost unfailing success, and the restoration to health of the diseased organ.

Phthisis is much more rare in Egypt amongst the natives than with the residents of any region in Europe. To a certain extent, the same may be said of the Europeans who have fixed their permanent abode here. Not so, however, with the Abyssinians and Nubians who enjoy in their native land an almost perfect immunity from consumption, but who perish from it in vast numbers

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when they are brought down to middle and lower Egypt.

As the northerly winds set in about November, and the climate of Cairo is then not too hot for the European invalid, he may safely arrange to arrive there at the beginning or middle of this month. The ascent of the river should be commenced before its expiration, so that Thebes may be reached in December. Here he may remain some little time, arriving in Nubia in the beginning of January, before which time the climate is too hot, and leaving it again about the middle of February for the same reason. Resting again for a short time at Thebes, the invalid should arrange to reach Cairo before the middle of March, at which time the heat on the Nile is too great to render a boat residence at all agreeable. Here he may remain until the end of the month, when the climate of Cairo itself begins to be too hot for a European invalid.

The usual mode of voyaging up the Nile is, for a party of from three to six persons, to agree with a Dragoman to take them in a proper boat, and during a fixed period (generally from ten to twelve weeks, if the second cataract be visited), the Dragoman being paid a fixed sum (ten pounds per month), and superintending all purchases and performing all the necessary services; or what is better and more usual—the Dragoman finding the boat, supplying food, and all other provisions for the voyage, guides, and donkeys for visiting the temples, tombs, &c., and paying all the additional charges, of whatever kind they may be. The usual payment for this arrangement is one guinea per day for each person; and in all cases it is most advisable that the agreement should be made at the Consulate; and all particulars as to the size and accommodations of the boat, the number of the crew, the number and nature of the meals, the time to be given for seeing the temples, tombs, &c., should be all carefully enumerated, as little trust is to be placed in the veracity and honesty

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of an Arab Dragoman, unless guarded by precautions like the above. They, are, however, for the most part, civil and obliging.

By a well-arranged journey of this kind, extending over a range of from Cairo lat. 30° N., to the second Cataract in Nubia, lat. 22° N. and back, the invalid may enjoy one continued series of bright warm days, with cloudless skies, and a dry, balmy, exhilarating atmosphere, the mere inhalation of which, to a debilitated and bronchitic patient, is an indescribable luxury. He feels, too, that this state of things is not merely an accidental occurrence, but one on which he can safely rely from day to day, with but very few exceptions, and he makes his arrangements accordingly, so far as the weather is concerned, with almost mathematical accuracy.

No reasonable person need now complain of the dietary on the Nile, which, though not very varied, may be made sufficiently so, and practically, generally is so, and almost always well adapted to the climate. The number, variety, and excellence of the dishes supplied to our table, were often a subject of very agreeable surprise.

The annoyance from vermin on the Nile has been very much exaggerated, and the boats are now fitted up with scrupulous cleanliness, and regard to the comfort and tastes of European invalids; nor is there now anything which need deter a delicate minded lady undertaking the voyage.

There are, however, and we have met with some such, who not only derive no advantage by leaving the comforts of their English home, and wintering in Egypt, but on the contrary, essentially suffer from it. These are either they who labour under some subacute disease; or whose symptoms are too far advanced to enable them to bear with impunity the little inconveniences, and occasional annoyances inseparable from a boat life with Arab

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sailors, or they are those who neglect the precautions which are essentially necessary for the full development of the advantages of a Nile voyage. The great difference of temperature between night and day, even in the shade, independent of the bright mid-day sun and the night fogs render it desirable that invalids labouring under chest disease should not expose themselves outside the boat much after sunset nor before sunrise, and certainly never without being protected by sufficient woollen clothing. These latter precautions are not so much needed between Thebes and Wady Halfa (a second cataract), as the nights there are warm and free from dew. Nor should the weak and enervated needlessly expose themselves, as some do, for many successive hours, to the direct rays of a scorching sun, or imbibe for nearly an equal period, the mephitic air of the interior recesses of the tombs, or of the great pyramid.

It has been remarked by a recent writer on the climate of Algiers:—"It is not of small moment to the invalid, that pleasure and amusement meet him at every step, that he has neither fatigue nor risk in seeking them; that they are all of a nature to amuse, without exciting him, adapted to all tastes, and to all capabilities.

In this point of view, Algiers contrasts most favourably with other places of resort, where the objects of interest are chilly cathedrals, cold picture galleries, and such like, which fashion demands the stranger shall visit, be he an invalid, or in health, and for which he must assume a spurious enthusiasm, if from defect of nature or education, he lacks the taste.

It is of real importance that the invalid shall leave his room, not full of some excursion to a cathedral or ruin, but simply to be in the open air, to wander about where his fancy may lead him, sure of finding himself gratified and amused. He returns ere he feels fatigue, for he has

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no prescribed mission or task which he must accomplish, in good spirits and refreshed, with as much to talk of and think of as he can desire."

Admitting the force of the above truths, it may safely be asserted that in all these particulars, as in most, though not all others, Egypt ranks much higher than either Algiers or Madeira as a winter resort for the European invalid.

I had prepared some remarks on the peculiarities and merits of each of these, as well as of those of the south of Europe, as compared with those of Egypt, and endeavoured to point out the classes of patients likely to derive benefit from them. No one can have seen much of continental places of resort for British Invalids without being painfully impressed with the conviction, that much unnecessary suffering, physical and mental, had been imposed on many of them, from an ignorance of the peculiar attributes of the several places, and the class of diseases and patients they were calculated to relieve.

The Physician has failed to point out to them "regiones quas elegire, quas vitare," or doing this, he has sent them from all the comforts and advantages of a home, and the careful attention of dear relatives and friends, to the discomforts and annoyances, inseparable, more or less, from a residence amongst strangers in a foreign land, when there could be no reasonable hope that the sufferer's troubles could be counterbalanced by a perfect or even partial restoration to health. That very climate which would at an early stage of the disease, and under certain conditions, have wrought much good, becomes in the advanced stage, and under different circumstances, the certain accelerator of a fatal issue. I must, however, defer these remarks to a future opportunity, as time will not allow of their adequate discussion.

In addition to the numerous and undoubted advantages

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enumerated above, and which, in combination and perfection, I believe, the climate of Upper Egypt and Nubia, possess over every other yet known to us; it has many others which should not be lightly passed over. The dyspeptic, the sufferer from chest disease, the rheumatic, the man whose constitution has been impaired by sedentary habits, anxious and harassing pursuits, or irregular living, may here, if anywhere, find the necessary means for recovering his lost vigour of mind and body.

In a brilliant and balmy climate, where mere existence is felt to be a positive luxury, and where the mind enjoys a serenity almost unknown in our foggy land, there is scarcely ever experienced any feeling of *ennui*, even when the traveller is confined to his boat, and that passing but slowly up the river, by tracking. The naturalist, and especially the entomologist, the botanist in a minor degree may ever find materials for examining and collecting. The sportsman may with his line or gun always meet with abundant occupation. The archæologist and antiquarian reap a rich harvest in the examination and contemplation of the wondrous remains of ancient art and science, as seen in the temples and tombs. The visits to adjoining hamlets—marking the habits and customs of the people, which illustrate so powerfully sacred writ, and classical authors—the pleasing intercourse between fellow-travellers going up or returning down the Nile, and the interchange of books or newspapers—making meteorological observations and entries in the diary, with a moderate proportion of pleasing and instructive reading—noticing the distinctness of the geological features, or the peculiar appearance of the moon, as white when on the horizon, as in mid-sky; or the sun set setting in a glory indescribable, to be succeeded by constellations brilliant and beautiful—admiring the deceitful mirage, or tracing the course and direction of the lofty sand-pillar—sketching the various

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objects, as the panorama glides slowly and pleasingly by—these and similar pursuits, cause the day to pass away so quietly and agreeably, that at the end of the voyage one is surprised to find that so much time has for ever fled.

"What dire necessities on every hand,
Our art, our strength, our fortitude require!
Of foes intestine what a numerous band
Against this little throb of life conspire!
Yet science can elude their fatal ire
Awhile, and turn aside death's level'd dart,
And brace the nerves once more, and cheer the heart,
And yet a few soft nights and balmy days impart."—BEATTIE.

FIFTEENTH ORDINARY MEETING.

ROYAL INSTITUTION, 31st May, 1858.

Dr. INMAN, PRESIDENT, in the Chair.

C. COLLINGWOOD, Esq., A.M., M.B., was elected an Ordinary Member.

The SECRETARY gave notice of a motion to alter the period of the Society's meetings, by advancing the session slightly, filling up the gap in passion week, and cutting off the May meetings.

Mr. W. DANSON forwarded for exhibition several specimens of cotton,—one called "Barraguda," and the other, the produce of the poplar tree; also a silky fibre of extreme tenuity, the production of an Australian insect, the habits of which were as yet but imperfectly known.

Mr. WHITEHEAD exhibited some large specimens of the *Mytilus edulis*, from the Bristol Channel.

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Mr. MARRAT submitted the *Veronica montana*, from Bromborough.

The SECRETARY, in the absence of the Author, read a paper,—"ON THE ADAPTABILITY OF WESTERN AFRICA FOR A COTTON SUPPLY, WITH A SYNOPTICAL NOTICE OF MR. JAMES LEES'S OPINION ON THE SIX MONTHS' COURSE OF SEASONS IN THE TROPICS." BY THOMAS J. HUTCHINSON, Esq., F.R.G.S., H.B.M. Consul, Fernando Po.

The following paper was then read:—

ON THE LIABILITY OF SHELLS TO INJURY FROM THE GROWTH OF A FUNGUS.

BY THE REV. H. H. HIGGINS, M.A.

IT has often been observed that shells kept for a considerable time in cabinets, are apt to lose much of their original freshness and beauty of appearance. This kind of injury chiefly affects such specimens as have a bright enamelled surface, which at length becomes dull, and less pleasant to the touch. Several suggestions have been made with reference to the probable cause of the change, which has often been attributed to the efflorescence of saline matter absorbed by the shell; but, so far as I have observed, the specimens most liable to injury from saline incrustation, belong to genera in which the shells are without enamel, as *Littorina*, *Turritella*, &c., and many collectors are in the habit of steeping their specimens in fresh water for some days before placing them in their cabinets, a process which is said to be an effectual preservative from injury by saline efflorescence. Mr. Dennison of Woolton attributed the loss of lustre in enamelled shells to the ravages of a minute insect, but had not been able to detect the depredator. Many of the shells in my own cabinet suffered such serious injury during last winter that I was led to investigate the cause, which indeed became obvious enough by the use of a microscope.

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An ordinary lens shewed the enamel of the shell to be beset with small bristly points, and when a portion of the surface was scraped off and submitted to a higher magnifying power, the forms of at least two species of Fungi became apparent, one resembling a Mucor with a globose sporangium, the other, and much more common form, exhibited both simple and moriliform filaments, with an abundance of minute spores, seemingly quite free. After having been carefully washed, the surface of the shell was found to be as it were engraved in some places with stellular marks, in others with striæ forming irregular reticulations, caused no doubt in each instance by the spreading mycelium of the Fungus. It is scarcely necessary to add that attacks of this nature need not be apprehended where shells are kept in a perfectly dry or well ventilated place. A slight deposition of moisture does however frequently occur upon their surfaces whilst shells are undergoing examination, in which case it would be a safe precaution to allow them for a while to remain exposed to the air before returning the drawer to the cabinet.

This closed the ordinary business of the session.

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DONATIONS

FROM JUNE, 1857, TO JUNE, 1858.

October 19th, 1857. *From the Government, through the Astronomer Royal*—Hansen's Tables de la Lune, 4to.

From the Earl of Dundonald—On the Bitumen of Trinidad.

From the Borough Engineer—Report of the Public Baths and Wash-houses.

From the Liverpool Compass Committee—First and Second Reports, as published by the Government and laid before Parliament.

From the Linnean Society—Proceedings, Vol. ii. No. 5.

From the Zoological Society—Proceedings, Nos. 314 to 333 inclusive.

From the Royal Astronomical Society—Notices, Vol. xvii., Nos. 7 and 8.

From the Historic Society of Lancashire and Cheshire—Transactions, Vol. ix.

From the Chemists' Association—Report, 1856-57.

From the Natural History Society, Dublin—Proceedings, part of Vol. iv.

From the Geological Society—Journal, Vol vii., Part 4.

From the Warwickshire Natural Historic Society—Twenty-first Report, April, 1857.

From the Editor—Provincial Magazine, 5 Nos.

From the Author—Report on the Water Supply, by Thomas Spencer.

From Drs. Nevins and Edwards—Copies of their Inquiry into the Action of the Liverpool Water upon Lead.

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November 2nd. *From Dr. Inman*—Volumes of British Association's Reports, completing series.

From the Royal Astronomical Society—Notices, Vol. xvii., No. 9.

From the Royal Institution of Great Britain—Notices, Part vii., 1857.

From the Plymouth Institution—Report, 1856-57.

From the Berwickshire Naturalists' Club—Proceedings, Vol. iv., No. 1.

From the Author—Rowell's Essay on Pain.

November 16th. *From the Liverpool Architectural Society*—Proceedings, Vol. ii., Part 3.

From the Royal Society, Edinburgh—Proceedings, 1856-57.

From the Linnean Society—Proceedings, Vol. ii., Part 6

November 30th. *From the Zoological Society*—Proceedings, Nos. 334 to 338 inclusive.

From the Author—Phenomena of Spinal Irritation, by Dr. Inman.

From J. Barnard Davis, Esq.—Du Chailler's Catalogue of Birds collected in Western Africa.

From C. Bell, Esq.—A Theological Work, in Spanish, of some antiquity, obtained in Mexico.

December 4th. *From the Literary and Philosophical Society, Manchester*—Memoirs, Vol. xiv.

Dalton's Chemical Philosophy, 3 Vols.

,, Meteorological Researches.

From the Tyneside Naturalists' Field Club—Proceedings, Vol. iii., Parts 2 and 3.

From the Royal Astronomical Society—Notices, Vol. xviii., No. 1.

From the Editor—Provincial Magazine, Nos. 6 and 7.

From the Author—Papers read before the Royal Society, by the Rev. T. P. Kirkman, M.A.

January 11th, 1858. *From the Geological Society of Dublin*—Journal, Vol. vii., Part 5.

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January 11th. *From the Geological and Polytechnic Society of the West Riding of Yorkshire*—Report of Proceedings, 1856-57.

From the Philosophical and Literary Society, Leeds—Report, 1856-57.

From the Author—The Redhill Catalogue of Circumpolar Stars, by Mr. Carrington.

January 25th. *From the Natural History Society, Dublin*—Proceedings.

From the Author—Sequel to the Statistical Details respecting the Republic of Lubeck, by the Rev. R. Everest, M.A.

From the Royal Astronomical Society—Notices, Vol. xviii., No. 2.

From the Editor—Provincial Magazine, No. 9.

February 8th. *From R. Stephenson, Esq.*—Correspondence regarding the Clinical Teaching in the University of Edinburgh.

From the Editor and Compiler—Documents and Proceedings connected with the Gift of the Free Public Library, by the Rev. Dr. Hume.

February 22nd. *From the Author*—The Nature of Inflammation, &c., by Dr. Inman.

From the Royal Astronomical Society—Notices, Vol. xviii., No. 3.

From the Manchester Natural History Society—Report.

From the Editor—Provincial Magazine, No. 10.

March 8th. *From the Linnean Society*—Proceedings, Vol ii., No. 7.

March 22nd. *From the Publisher, Mr. Greenwood*—Photographic Journal, Vols. 1 and 2.

From the Royal Institution—Report.

From the Royal Astronomical Society—Notices, Vol. xviii., No. 4.

From the Editor—Provincial Magazine, No. 11.

From the Publisher—The Emperor Napoleon III. and England.

April 19th. *From the Royal Astronomical Society*—Notices, Vol. xviii., No. 5.

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April 19th. *From the Zoological Society*—Proceedings, Nos. 339 to 348 inclusive.

From the Author—On the Mastodon and Elephant, by Dr. Falconer.

May 17th. *From the Royal Astronomical Society*—Notices, Vol. xviii., No. 6.

From the Editor—Provincial Magazine, No. 12.

From the Author—On Rotatory Motion, by Mr. Hunt.

May 31st. *From the Linnean Society*—Proceedings, Vol. ii., No. 8.

From Mr. W. Danson—Account of the Aviru.

From the Warwickshire Natural History Society—Report.

The Diagram at page 196 is presented by Dr. Dickinson.

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APPENDIX.

SYNOPSIS AND LIST

OF

BRITISH HYMENOMYCETES,

ARRANGED ACCORDING TO THE EPICRISIS OF M. FRIES.

BY THE

REV. HENRY H. HIGGINS, M.A. CANTAB, V.P.

READ BEFORE THE SOCIETY ON THE 10TH APRIL, 1858.

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ABBREVIATIONS, &c.

E.F. The English Flora, vol. 5, by the Rev. M. J. Berkeley. 1836.

The number following the letters E.F. refers to the position of the species in the genus, as given in the English Flora. In the Agaricini the numbers, unless otherwise indicated, all refer to the genus Agaricus.

An. Annals and Magazine of Natural History.

The number following this abbreviation refers to Notices of British Fungi in the Annals, forming a series numbered throughout consecutively.

Grev. Scottish Cryptogamic Flora, by Robert Kaye Greville, F.R.S. & F.A.S.E. 6 vols., 8vo. Edin. 1823.

Sow. English Fungi, by James Sowerby, F.L.S. 4 vols., Fol. London. 1797.

Bolt. History of Fungusses growing about Halifax, by James Bolton. 4 vols., 4to. Halifax. 1788.

H.H.H. A few species collected by the Editor, which do not appear to have been hitherto noticed as British.

† Species supposed not to be included in the Epicrisis.

The arrangement is taken from the Epicrisis of M. Fries, but a few corrections have been made, for which the Editor is indebted chiefly to the "Introduction to Cryptogamic Botany," by the Rev. M. J. Berkeley, M.A., F.L.S. One vol., 8vo. London. 1857.

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NOTICES OF BRITISH FUNGI

PUBLISHED IN THE

ANNALS AND MAGAZINE OF NATURAL HISTORY.

Nos.	1-58	Magazine of Zoology and Botany,		vol. 1.	
,,	59-137	Annals,		vol. 1.	
,,	138-256	,,		vol. 7.	1841.
,,	257-322	,,		vol. 13.	1844.
,,	323-379	,,	2nd Series,	vol. 2.	1848.
,,	380-501	,,	,,	vol. 5.	1850.
,,	502-614	,,	,,	vol. 7.	1851.
,,	615-661	,,	,,	vol. 9.	1852.
,,	662-784	,,	,,	vol. 13.	1854.

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FUNGALES.

LINDLEY.

Hysterophytal or epiphytal, cellular, flowerless plants, deriving nutriment by means of a mycelium, from the matrix, never producing from their component threads, green bodies resembling chlorophyll (gonidia).*

SYNOPSIS of FUNGALES. Berkeley.

SPORIFERI. Naked Spores.

HYMENOMYCETES.

Spores naked. Hymenium free, mostly naked, or if inclosed at first, soon exposed.

GASTEROMYCETES.

Spores naked. Hymenium inclosed in a peridium seldom ruptured before maturity.

CONIOMYCETES.

Spores naked, mostly terminal, seated on inconspicuous threads, free or inclosed in a perithecium.

HYPHOMYCETES.

Spores naked, variously seated on conspicuous threads, which are rarely compacted; mostly small in proportion to the threads.

* Berkeley's Introduction to Cryptogamic Botany. 1857.

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Sporidiiferi. Sporidia insacs.

PHYSOMYCETES.

Fertile cells seated on threads not compacted into an hymenium.

ASCOMYCETES.

Asci formed from the fertile cells of an hymenium.

Synopsis of HYMENOMYCETES. Berkeley.

Hymenium Inferior, except in resupinate forms.

AGARICINI. Fries.

Fructifying surface lamellose.

POLYPOREI. Fries.

Fructifying surface porose or tubular.

HYDNEI. Fries.

Fructifying surface clothed with prickles.

AURICULARINI. Fries.

Fructifying surface even, without folds, tubes, prickles, &c.

Hymenium Superior, or circumambient.

CLAVARIEI. Fries.

Clavate or variously branched, rarely lobed or gelatinous.

TREMELLINI. Fries.

Lobed, convolute, or disciform, gelatinous; fertile threads not compacted into a true hymenium.

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Synopsis of AGARICINI. Fries Ep.

I.—*Gills soft, membranaceous, splitting longitudinally with ease, edge single.*

Genus 1. AGARICUS. 980 Species. Fries Ep.*

Gills neither compacted nor dissolving into black juice; trama concrete with the sub-floccose substance of the pileus; basidia crowned with sterigmata, bearing simple spores, which are at length driven off.

Genus 2. COPRINUS. 50 Species. Fries Ep.

AGARICUS in part E.F.

Gills at first compacted, at length dissolving into black juice; trama none; spores brown-purple or blackish. Mostly fimetarious.

Genus 3. BOLBITIUS. 6 Species. Fries Ep.

AGARICUS in part E.F.

Gills at first compacted, at length sub-deliquescent; spores ferruginous. Fragile and fugacious, sub-fimicolous, growing in pastures.

Genus 4. CORTINARIUS.‡ 216 Species. Fries Ep.

AGARICUS in part E.F.

Volva, when present discrete; veil, when present arachnoid or fibrillose; gills changing colour, becoming dry, powdered with the cinnamon spores, which are not driven off in drying. The spores shed on paper appear sub-ochraceous. Fleshy. Terrestrial.

Genus 5. PAXILLUS. 9 Species. Fries Ep.

AGARICUS in part E.F.

Pileus fleshy, concrete with the stem; margin at first involute; gills forked, rather close, decurrent, inclining to form pores at the base, easily separable from the pileus; spores globose, sub-ferruginous. Growing on the ground.

Genus 6. GOMPHIDIUS. 3 Species. Fries Ep.

Sub-genus GOMPHUS E.F.

Pileus fleshy, concrete with the stem; volva glutinous; gills distant, decurrent; spores elongated, somewhat compound. On the ground in woods.

* Including species from all parts of the world.

‡ The generic characters of Cortinarius are obscure. In the index of the Epicrisis, and in a later work entitled "Cortinarii et Hygrophori Sueciæ," M. Fries gives the "universal, discrete, arachnoid veil" as one of the principal marks: whereas, in the first species, C caperatus, which he styles "princeps hujus gregis," he rightly describes the universal veil as "floccose-farinose;" in the group Myxacium it is glutinous, and in many of the succeeding species it seems obsolete.

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II.—*Gills of a somewhat waxy consistence, splitting longitudinally with difficulty.*

Genus 7. HYGROPHORUS. 50 Species. Fries Ep.

AGARICUS in part E.F.

Pileus viscid or moist; trama granulose; gills distant, abounding in watery juice, often connected by veins; spores colourless, at length driven off. Middle sized. Growing on the ground.

Genus 8. LACTARIUS. 64 Species. Fries Ep.

Sub-genus GALORRHEUS E.F.

Pileus fleshy, at length depressed; trama vesiculose; gills adnato-decurrent, when bruised yielding a milky juice; spores globose.* Large or middle sized. Growing on the ground under or near trees.

Genus 9. RUSSULA. 42 Species. Fries Ep.

AGARICUS in part E.F.

Pileus fleshy, at length depressed; trama vesiculose; gills juiceless, narrow behind; spores round, yellowish in a few species. Rather large. Growing on the ground.

Genus 10. CANTHARELLUS. 24 Species. Fries Ep.

Trama concrete with the floccose substance of the pileus; veil none; gills somewhat branched, resembling blunt folds; spores white.

Genus 11. NYCTALIS. 6 Species. Fries Ep.

AGARICUS in part E.F.

Pileus juicy; gills unequal, edge blunt; volva flocculoso-pruinose. Rather small. Growing in caves or vaults, or on decayed Agarics.

III.—*Gills tough; subcarnose, tough or subcoriaceous fungi, hence not readily decaying.*

Genus 12. MARASMIUS. 51 Species. Fries Ep.

AGARICUS in part E.F.

Pileus thin, at length more or less corrugated, substance dry, concrete with the floccose trama; gills blunt behind; stem sub-cartilaginous; spores sub-eliptic, white. Small or middle-sized. Growing chiefly on or amongst dead leaves.

Genus 13. LENTINUS. 50 Species. Fries Ep.

AGARICUS in part E.F.

Pileus coriaceous, substance concrete with that of the stem; gills thin, edge acute, broken or dentato-lacerate; spores white, rarely yellowish. Of slow growth. Mostly epixylous.

* In all the species of Lactarius that I have examined the spores are more or less rough or echinulate.

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Genus 14. PANUS. 16 Species. Fries Ep.

AGARICUS in part E.F.

Hymenophore as in the preceding Genus; gills unequal, edge acute, entire. Irregularly shaped or lateral. Epixylous.

Genus 15. XEROTUS. 7 Species. Fries Ep.

AGARICUS in part E.F.

Gills adnato-decurrent, branched, resembling folds. Whole plant rigid.

IV.—*Coriaceous or corky fungi.*

Genus 16. SCHIZOPHYLLUM. 3 Species. Fries Ep.

Gills forked, radiating like the spokes of a fan, edge bifid, segments revolute. Epixylous.

Genus 17. LENZITES. 20 Species. Fries Ep.

Sp. DÆDALEA. E.F.

Gills forked, radiating, forming pores at the base; edge subacute. Dimidiate fungi growing on wood.

Synopsis of AGARICUS.

SERIES I. **Leucospori.**

Spores colourless or dull white.

Stem central; veil woven, conspicuous.

Sub-Genus AMANITA.

Volva distinct; conspicuous fungi growing on the ground; the ruptured volva usually forms warts or patches on the pileus.

Sub-Genus LEPIOTA.

Volva concrete with the epidermis of the pileus: gills free, not rounded behind. Large or middle-sized fungi growing on the ground; the epidermis of the pileus often broken into squarrose scales.

Sub-Genus ARMILLARIA.

Veil forming a persistent ring; gills adnate or decurrent.

Stem central; veil inconspicuous or fibrillose.

Sub-Genus TRICHOLOMA.

Stem fleshy; gills bluntly rounded behind. Fleshy fungi growing on the ground; pileus often covered with a nap.

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Sub-Genus CLITOCYBE.

Stem elastic, stuffed, outer coat compact, fibrous; gills attenuated behind, adnate or decurrent; pileus for the most part plano-depressed or infundibuliform. Somewhat fleshy fungi growing on the ground.

Sub-Genus COLLYBIA.

Stem fistulose or pithy, outer coat cartilaginous; gills free or bluntly adnexed; pileus sub-carnose, plano-convex or depressed; margin at first involute. More or less epixylous.

Sub-Genus MYCENA.

Stem fistulose; pileus sub-membranaceous, campanulate; margin never involute; gills not decurrent, except by a tooth. Graceful. Terrestrial or epixylous.

Sub-Genus OMPHALIA.

Stem cartilaginous; pileus sub-membranaceous; gills truly decurrent.

Excentric, lateral, or sessile.

Sub-Genus PLEUROTUS.

Stem excentric, lateral, or none. Mostly growing upon wood.

SERIES II. **Hyporhodii.**

Spores rose-coloured.

Gills quite free.

Sub-Genus VOLVARIA.

Volva distinct; gills ventricose. Resembling an Amanita, with reddish spores.

Sub-Genus PLUTEUS.

Volva concrete with the epidermis of the pileus.

Gills touching the stem.

Sub-Genus ENTOLOMA.

Stem fleshy or fibrous; gills bluntly rounded behind. Somewhat fleshy fungi generally growing on the ground.

Sub-Genus CLITOPILUS.

Stem fleshy or fibrous; gills attenuated behind; sub-decurrent; pileus more or less depressed.

Sub-Genus LEPTONIA.

Stem cartilaginous, shining; gills adnexed, at length retreating; pileus thin; margin at first incurved.

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Sub-Genus NOLANEA.

Stem fistulose; pileus sub-membranaceous, campanulate. Graceful fungi growing on the ground.

Sub-Genus ECCILIA.

Stem cartilaginous; gills truly decurrent.

Series III. **Dermini.**

Spores ferruginous, rarely tawney or brownish.

Stem central; veil woven.

Sub-Genus PHOLIOTA.

Veil forming a persistent ring.

Stem central; veil not woven, nor forming a ring.

Sub-Genus HEBELOMA.

Stem fleshy; gills bluntly rounded behind; spores brownish; veil fibrillose or obsolete.

Sub-Genus FLAMMULA.

Stem fleshy-fibrous; gills adnate or decurrent. Chiefly cæspitose fungi growing on wood.

Sub-Genus NAUCORIA.

Stem cartilaginous; pileus convexo-plane; margin at first inflexed.

Sub-Genus GALERA.

Stem sub-cartilaginous, fistulose; pileus oval or expanded, sub-membranaceous; margin never inflexed. Graceful, fragile fungi.

Excentric or lateral.

Sub-Genus CREPIDOTUS.

Pileus excentric, or lateral, or resupinate. Chiefly growing on wood.

Series IV. **Pratellæ.**

Spores purple-black or brown.

Sub-Genus PSALLIOTA.

Veil forming a persistent ring.

Sub-Genus HYPHOLOMA.

Veil woven, adhering to the margin of the pileus; stem fleshy or fibrous; pileus somewhat fleshy; margin incurved. Cæspitose fungi chiefly growing on wood.

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Sub-Genus PSILOCYBE.

Veil inconspicuous; stem sub-cartilaginous, firm, and tough; gills becoming brown or purplish; pileus somewhat fleshy, smooth; margin at first incurved.

Sub-Genus PSATHYRA.

Stem fistulose, shining, fragile; pileus conical or campanulate. Graceful fungi, fragile and hygrophanous.

SERIES V. **Coprinarii.**

Spores black.

Sub-Genus PANÆOLUS.

Stem smooth, rather firm; gills ascending, dappled grey and black, becoming moist, at first projecting beyond the margin; slightly fleshy fungi, usually growing in dungy places.

Sub-Genus PSATHYRELLA.

Pileus membranaceous, striated; gills smoky, not dappled, nor projecting beyond the margin.

Synopsis of COPRINUS.

TRIBE I. *PELLICULOSI.*

Gills attached to a pellicle, causing the pileus to be torn irregularly in deliquescence.

TRIBE II. *VELIFORMES.*

Pileus extremely thin, splitting in the direction of the gills in deliquescence.

Synopsis of CORTINARIUS.

Sub-Genus PHLEGMACIUM.

Veil fibrillose, dry; stem firm, dry; pileus evenly fleshy.

Sub-Genus MYXACIUM.

Volva glutinous, whence the stem is viscid; scarcely bulbous; pileus fleshy, rather thin; gills adnate decurrent.

Sub-Genus INOLOMA.

Veil simple; pileus evenly fleshy, dry; stem fleshy, sub-bulbous.

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Sub-Genus DERMOCYBE.

Veil simple; pileus thinly but evenly fleshy, at first silky, then bare, dry; stem equal or attenuated, outer coat harder.

Sub-Genus TELAMONIA.

Pileus hygrophanous, becoming thin abruptly; volva from beneath investing the stem with a ring or squamose sheath; stem from above sub-cortinated.

Sub-Genus HYGROCYBE.

Pileus smooth, thin, hygrophanous; web of the veil properly adhering to the margin; stem altogether smooth, sub-cartilaginous.

Synopsis of HYGROPHORUS.

Sub-Genus LIMACIUM.

Volva viscid; pileus fleshy, viscid; stem scaly; gills adnato-decurrent.

Sub-Genus CAMAROPHYLLUS.

Veil none; stem smooth; pileus moist, not viscid; gills vaulted, distant.

Sub-Genus HYGROCYBE.

Veil none; whole plant somewhat thin, succulent; chiefly brightly coloured fungi, growing in open grassy places.

Synopsis of LACTARIUS.

TRIBE I. *PIPERITES.*

Milk from the first white, acrid; gills neither changing colour nor whitely pruinose.

TRIBE II. *DAPETES.*

Milk from the first highly coloured.

TRIBE III. *RUSSULARES.*

Gills at length whitely pruinose.

TRIBE *IV.* *LATERIPEDES.*

Excentric.

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Synopsis of RUSSULA.

TRIBE I. *COMPACTÆ.*

Pileus fleshy; margin smooth; stem solid; gills unequal.

TRIBE II. *FIRMÆ.*

Pileus firmly fleshy, viscid when moist, abruptly thin towards the margin, which is obsoletely striate.

TRIBE III. *RIGIDÆ.*

Pileus dry; cuticle often granulose; gills not numerous.

TRIBE IV. *FRAGILES.*

Pileus covered with a pellicle, which, when moist, is viscid and sub-separable; margin commonly furrowed and tuberculated.

Synopsis of MARASMIUS.

Sub-Genus COLLYBIA.

Pileus sub-carnose, tough, at length sub-coriaceous, corrugated; margin at first involute; stem floccose at the base.

Sub-Genus ROTULA.

Stem filiform; pileus nearly plain or umbilicated. Small fungi chiefly growing on leaves.

Synopsis of POLYPOREI. Fries Ep.

Genus 18. BOLETUS, L. 60 Species. Fries Ep.

Pileus fleshy, furnished with a central stem; fructifying surface consisting of tubes easily separable from the pileus, and amongst themselves. Terrestrial.

Genus 19. POLYPORUS, Micheli. 280 Species. Fries Ep.

Pores sub-rotund, at first obsolete or very small; dissepiments more or less distinct from the pileus in substance or in colour.

Genus 20. TRAMETES, Fries. 20 Species. Fries Ep.

Pileus corky or woody; substance forming sub-rotund, not sinuous, pores. Arboreal or epixylous.

Genus 21. DÆDALIA, Persoon. 16 Species. Fries Ep.

Pileus corky; substance forming elongated sinuous pores. Arboreal or epixylous.

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Genus 22. MERULIUS, Haller. 20 Species. Fries Ep.

Hymenophore sub-floccose; pores incomplete, sometimes mere shallow cavities or sinuous depressions. Epixylous.

Genus 23. POROTHELIUM, Fries. 4 Species. Fries Ep.

Resupinate, expanded; substance woven from the mycelium; sub-membranaceous, with projecting papillæ, which are distinct from the first, soon open pore-wise, at length elongated, tubular.

Genus 24. FISTULINA, Bulliard. 2 Species. Fries Ep.

Pileus fleshy; tubes at first wart-like, closed, at length open. Epixylous.

Synopsis of POLYPORUS.

Sub-Genus MESOPUS.

Pileus entire; stem simple, central; base of the same colour.

Sub-Genus PLEUROPUS.

Pileus tough or corky, horizontal, not circinate; stem simple, ascending, corticated, either distinctly lateral, or excentric with a black base. Arboreal or epixylous.

Sub-Genus MERISMA.

Stem compound, arising from a common tubercle or base, extremities bearing numerous pileoli.

Sub-Genus APUS.

Pileus sessile, properly adnate and dimidiate, with a thickened and dilated base; or entire, attached by an umbo; or attenuated at the base; or sometimes, but not normally, wholly resupinate.

I. *ANODERMEI.*

Pileus not covered by a cuticle, zoneless; annual.

II. *PLACODERMEI.*

Pileus becoming hard, covered with a close crust, zoneless or concentrically grooved. Persistent.

III. *INODERMEI.*

Pileus from the first dry and firm, covered with a thin fibrous cuticle.

Sub-Genus RESUPINATUS.

Pileus none; pores springing from the mycelium without any intervening substance.

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Synopsis of HYDNEI. Fries Ep.

Genus 25. HYDNUM, L. 96 Species. Fries Ep.

Hymenial processes concrete, spine-like, free. Basidia firm; sterigmata chiefly quaternate.

Genus 26. SISTOTREMA, Pers. 5 Species. Fries Ep.

Hymenial processes inferior, sub-discrete, forming dentate or spinous, curved, lamellulae, irregularly disposed; Basidia firm tetrasporous.

Genus 27. IRPEX, Fries. 20 Species. Fries Ep.

Hymenial processes concrete, sub-coriaceous, spine-like, disposed in ranks or reticulations, anastomosing at the base.

Genus 28. RADULUM, Fries. 10 Species. Fries Ep.

Hymenial processes of no constant shape, commonly elongated, more or less truncate or obtuse, scattered or collected in patches. Resupinate, epixylous.

Genus 29. PHLEBIA, Fries. 3 Species. Fries, Ep.

Hymenium amphigenous, corrugated, then smooth, with interrupted wrinkles; resupinato-effused, cartilaginous when dry.

Genus 30. GRANDINIA, Fries. 7 Species. Fries Ep.

Hymenial processes papillose, or rather granulose, close; effused; substance forming a somewhat soft crust. Basidia filiform, interlacing, monosporous.

Genus 31. ODONTIA, Fries. 5 Species. Fries Ep.

Hymenial processes wart-like or papillose, rarely spine-like, multifid at the apex, resupinate; substance fibrous, dry, not waxy. Basidia filiform, monosporous.

Genus 32. KNEIFFIA, Fries. 1 Species. Fries Ep.

Hymenium beset with rigid bristles; substance soft, flocculose.

Synopsis of AURICULARINI. Fries Ep.

Genus 33. CRATERELLIUS, Fries. 12 Species. Fries Ep.

Hymenium inferior, sub-ceraceous, with indistinct or raised veins; pileus stipitate, tubiform, or infundibuliform, between fleshy and membranaceous. Terrestrial.

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Genus 34. THELEPHORA, Ehrh. 56 Species. Fries Ep.

Hymenium sub-inferior, with costate, ramose, or papillose striæ, concrete with the woven, floccose, or fibrous hymenophore, which is destitute of a proper cuticle.

Genus 35, STEREUM, Fries. 56 Species. Fries Ep.

Hymenium inferior, smooth, or spuriously nodulose, concrete with the coriaceous or woody, persistent, hymenophore; reflexed disc, when present, zoned, with a crust-like or fibrous cuticle.

Genus 36. AURICULARIA, Fries. 4 Species. Fries Ep.

Hymenium remotely and irregularly costatoplicate, when moist sub-gelatinous, tumid; hymenophore coriaceous, persistent, but shrinking very much when dry.

**Genus* 37. CORTICIUM, Fries. 51 Species. Fries Ep.

Hymenium amphigenous, of a soft fleshy or waxy consistence, undulated or papillose; when dry shrinking and becoming hard, smooth, often rimose; hymenophore resupinate, floccose, frequently disappearing except at the margin, leaving only the fertile stratum on the matrix.

Genus 38. CYPHELLA, Fries. 15 Species. Fries Ep.

Hymenium forming the concave surface of the cup-shaped, membranaceous pileus.

Synopsis of THELEPHORA.

I. *MESOPUS.*

Stem simple, central.

II. *PLEUROPUS.*

Stem simple, lateral.

III. *MERISMA.*

Substipitate, broken up into irregular branches, or imbricato-cæspitose; base not effused.

IV. *APUS.*

Sessile; base spreading; margin free, effigurate, laciniate or lobate.

V. *RESUPINATUS.*

Resupinate; margin byssoid or fibrillose.

* The species of Stereum and Corticeum are very frequently found in an abnormal, sterile, membranaceous condition, especially when growing on the bark of trees.

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Synopsis of STEREUM.

I. *MESOPUS.*

Stem central, distinct, simple.

II. *PLEUROPUS.*

Pileus distinct; stem lateral.

III. *MERISMA.*

Pilei cæspitose; substipitate.

IV. *APUS.*

Hymenophore sessile, at first wholly resupinate, at length with a reflexed disc, never adhering closely to the matrix; margin defined.

V. *RESUPINATUS.*

Hymenophore, resupinate, crustaceo-adnate, but capable of being separated from the matrix entire; margin never byssoid.

Synopsis of CORTICIUM.

I. *APUS.*

Hymenophore not adhering closely to the matrix; margin defined, somewhat loose or reflexed.

II. *HIMANTIA.*

Effused, indeterminate; margin byssoid, or strigose and free. The hymenium, when in right order, has a beautiful appearance, and is of a soft waxy consistence.

III. *LEIOSTROMA.*

Hymenium adhering closely to the matrix, for the most part without any intervening hymenophore, the mycelium rapidly changing into hymenium, and appearing, if at all, only at the margin, where it somewhat abruptly thins out.

Synopsis of *CLAVAREI.* Fries Ep.

Genus 39. CLAVARIA. Vaill. 64 Species. Fries Ep.

Fleshy, branched or simple, terete, hymenium superficial, wax-like; dry, persistent. Basidia tetrasporous. Mostly terrestrial.

Genus 40. CALOCERA. Fries. 12 Species. Fries Ep.

Gelatinoso-cartilaginous, horny when dry, branched or simple. Hymenium viscid. Basidia filiform, branched, bearing spores at the tips. Epixylous.

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Genus 41. TYPHULIA. Fries. 14 Species. Fries Ep.

Sub-byssoid; stem filiform, flaccid, invested towards the apex by the discrete hymenium. Delicate, chiefly found on or, amongst dead leaves. Basidia forked; sterigmata long, subulate.

Genus 42. PISTILLARIA. Fries. 10 Species. Fries Ep.

Minute, club-shaped, between waxy and horny. Stem cylindrical, dilated above, invested the hymenium. Basidia simple or forked. Found mostly on dead leaves or stems.

Synopsis of TREMELLINÆ. Fries Ep.

Genus 43. TREMELLA. Pers.

Soft, homogeneous, multiform, often somewhat transparent.

Genus 44. EXIDIA. Fries. 12 Species. Fries Ep.

Stroma firm, elastic, more or less cup-shaped, covered above only by the hymenium.

Genus 45. NÆMATELIA. Fries. 3 Species. Fries Ep.

Stroma covered on all sides by the hymenium, and enclosing a compact fleshy nucleus.

Genus 46. DACRYMYCES. Nees.

Stroma tuberculiform, sessile, covered by the hymenium: spores concatinate.

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LIST OF

BRITISH HYMENOMYCETES.

Fam. 1. *AGARICINI*. Fries.

Genus 1. AGARICUS. L.

Series 1. **Leucospori.**

Sub-genus 1. AMANITA.

1 A. phalloides. Fr. E.F. 1.
2 A. muscarius. L. E.F. 4.
3 A. pantherinus. Dec. E.F. 6.
4 A. strobiliformis. Vit. An. 662.
5 A. Mappa. Willd. An. 138.
6 A. rubescens. Pers. E.F. 8.
7 A. excelsus. Fr. E.F. 7.
8 A. asper. Pers. E.F. 9.
9 A. vaginatus. Bull. E.F. 2.
var. nivalis. Grev. E.F. 3.
10 A.†Cecilliæ. Berk. An. 663.

Sub-genus 2. LEPIOTA.

11 A. procerus. Scop. E.F. 10.
12 A. rachodes. Vit. An. 257.

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13 A. EXCORIATUS. Schœff. E.F. 11.
14 A. MASTOIDEUS. Fr. An. 1.
15 A. ACUTE-SQUAMOSUS. Wein.=A. MARIÆ. Kl.E.F. 5. An. 139.
16 A.†BADHAMI. Berk. An. 664.
17 A. CLYPEOLARIUS. Bull. E.F. 13.
18 A.†POLYSTICTUS. Berk. E.F. 14.
19 A. CRISTATUS. Fr. E.F. 16. syn.
20 A.†HÆMATOPHYLLUS. Berk. An. 38.
21 A. CEPÆSTIPES. E.F. 12?
22 A. GRANULOSUS. Batsch. E.F. 17.
var. AMIANTHINUS.=A. CROCEUS. Bolt. t. 51. fig. 2.

Sub-genus 3. ARMILLARIA.

23 A. CONSTRICTUS. Fr. E.F. 18.
24 A. MELLEUS. Vahl. E.F. 20.
25 A. LARICINUS. Bolt. t. 19.
26 A. MILLUS. Sow. E.F. 88.
27 A. MUCIDUS. Schrad. E.F. 19.

Sub-genus 4. TRICHOLOMA.

I. *LIMACINA.*
28 A. EQUESTRIS. L. An. 665.
29 A. SEJUNCTUS. Sow. E.F. 38.
30 A. PORTENTOSUS. Fr. An. 666.
31 A. FUCATUS. Fr. E.F. 29.
32 A. NICTITANS. Bull. An. 667.
33 A. FLAVOBRUNNEUS. Fr.=A. FULVUS. E.F. 28 syn.
34 A. ALBOBRUNNEUS. Pers. E.F. 27.
35 A. FRUMENTACEUS. Bull. An. 678.
II. *GENUINA.*
36 A. RUTILANS. Schœff. E.F. 32.
37 A. LURIDUS. Schœff. E.F. 30.
38 A. COLUMBETTA. Fr. E.F. 37. An. 259.
39 A. IMBRICATUS. Fr. E.F. 33.
40 A. VACCINUS. Schœff. E.F. 34.

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41 A. TERREUS.=A. ARGYRACEUS. Bull. E.F. 36.

42†A. MULTIFORMIS. Schœf. E.F. 35.

III. *RIGIDA.*

43 A. MELEAGRIS. Sow. E.F. 15.

44 A. CUNEIFOLIUS. Fr. E.F. 109.

IV. *SERICELLA.*

45 A. SULPHUREUS. Bull. E.F. 104.

46 A. LASCIVUS. Fr. E.F. 105.

47 A. INAMŒNUS. Fr. E.F. 106.

V. *GUTTATA.*

48 A. GAMBOSUS. Fr. An. 140.

VI. *SPONGIOSA.*

49 A. PERSONATUS. Fr. E.F. 39.

50 A. NUDUS. Bull. E.F. 40.

51 A. ACERBUS. Bull. An. 668.

VII. *HYGROPHANA.*

52 A. GRAMMOPODIUS. Bull. E.F. 87. E.F. 79 descrip. An. 61.

53 A. BREVIPES. Bull.=A. BLANDUS. E.F. 41. An. 260.

54 A. SUBPULVERULENTUS. Pers. An. 669.

Sub-genus 5. CLITOCYBE.

I. *DISCIFORMES.*

55 A. NEBULARIS. Batsch.=A. CANALICULATUS. E.F. 80.

56 A. CLAVIPES. Pers.=A. MOLLIS. Bolt. t. 40.

57 A. FUMOSUS. Pers. E.F. 81.

58 A. INORNATUS. Sow. E.F. 89.

59 A. VIRIDIS. With. E.F. 82.

60 A. ODORUS. Bull. E.F. 83.

61 A. VERNICOSUS. Fr.=A. FLAVIDUS. Sow. t. 366.

62 A. CERUSSATUS. Fr. E.F. 86. An. 670.

63 A. PHYLLOPHILUS. Pers. E.F. 78.

64 A. CANDICANS. Pers. E.F. 84.

65 A. DEALBATUS. Sow. E.F. 85.

66 A. GALLINACEUS. Scop. Bolt. t. 4, fig. 2.

II. *DIFFORMES.*

67 A. OPACUS. With. Sow. t. 142. E.F. 86 syn.

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III. *INFUNDIBULIFORMES.*

68 A. GIGANTEUS. Sow. E.F. 76.

69 A. INFUNDIBULIFORMIS. Schœff. E.F. 75 syn.

70 A. GILVUS. Pers. E.F. 73. An. 265.

71 A. GEOTRUPUS. Bull.=A. INFUNDIBULIFORMIS. var. β m. E.F. 75.

72 A. INVERSUS. Scop.=A. FIMBRIATUS. var. A. LOBATUS. E.F. 90.

73 A. FLACCIDUS. Sow. E.F. 74.

IV. *CYATHIFORMES.*

74 A. CYATHIFORMIS. Bull. E.F. 177.

V. *ORBIFORMES.*

75 A. METACHROUS. Fr. E.F. 176.

76 A. FRAGRANS. Sow. E.F. 175.

VI. *VERSIFORMES.*

77 A. DIFFORMIS.* Pers.=A. UMBILICATUS. Bolt. t. 17.

78 A. BELLUS. Pers. E.F. 103.

79 A. LACCATUS. Scop. E.F. 102.

var. FARINACEUS. Sow. t. 208.

var. AMETHYSTINUS. Sow. t. 187.

80 A. TORTILIS. Bolt. t. 41.

Sub-genus 6. COLLYBIA.

I. *STRIÆPODES.*

81 A. RADICATUS. Relh. E.F. 110.

82 A. LONGIPES. Bull. An. 64.

83 A. PLATYPHYLLUS. Fr. An. 263 and 323.

84 A. FUSIPES. Bull. F.F. 112.

85 A. MACULATUS. Alb. and Schw. E.F. 113.

86 A. BUTYRACEUS. Bull. E.F. 114.

87 A. EPHIPPIUM.* Fr.=A. COMPRESSUS. Sow. E.F. 115?

88 A. PULLUS. Schœff.=A. CONCINEUS. Bolt. t. 15.

II. *VESTIPEDES.*

89 A. VELUTIPES. Curt. E.F. 111.

90 A. LAXIPES. Bat. Sow. t. 263?

* See Epicrisis, page 121, on A. umbilicatus.

* See Epicrisis, page 54, on A. lixivius.

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91 A. STIPITARIUS. Fr.=A. CAULICINALIS. E.F. 136.
92 A. ALUMNUS. Fr. Bolt. t. 155. E.F. 128 syn.
93 A. CONFLUENS. Pers. E.F. 116.
94 A. CONIGENUS. Pers. E.F. 126.
95 A. †UNDATUS. Berk. E.F. 127. An. 43.
96 A. TUBEROSUS. Bull. E.F. 128. An. 44.
97 A. RACEMOSUS. Pers. An. 45.

III. *LÆVIPEDES.*

98 A. XANTHOPUS. Fr. E.F. 117.
99 A. ESCULENTUS. Wulf. E.F. 124.
100 A. TENACELLUS. Pers. E.F. 125.
101 A. DRYOPHYLLUS. Bull. E.F. 118.
102 A. CLAVUS. Bull. E.F. 130.
103 A. OCELLATUS. Fr. E.F. 129.
104 A. MICHELIANUS. Fr.=A. EBURNEUS. Bolt. t. 4, fig. 2.

IV. *TEPHROPHANÆ.*

105 A. ATRATUS. Fr. An. 671.

Sub-genus 7. MYCENA.

I. *CALODONTES.*

106 A. PELIANTHINUS. Fr. E.F. 107. An. 2.
107 A. BALANINUS. Berk. An. 42.
108 A. ELEGANS. Pers. E.F. 150.
109 A. STROBILINUS. Pers. E.F. 151.

II. *ADONIDEÆ.*

110 A. PURUS. Pers. E.F. 152.
111 A. ADONIS. Bull. E.F. 153.
112 A. LUTEO-ALBUS. Bolt. E.F. 154.
113 A. LACTEUS. Pers. E.F. 155.

III. *RIGIDIPEDES.*

114 A. PROLIFERUS. Sow. t. 169. E.F. 146 syn.
115 A. GALERICULATUS. Scop. E.F. 146.
116 A. POLYGRAMMUS. Bull. E.F. 147.
117 A. PARABOLICUS. Alb. and Schw. Sow. t. 165. E.F. 146 syn.

IV. *FRAGILIPEDES.*

118 A. ATRO-ALBUS. Bolt. E.F. 141.

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119 A. DISSILIENS. Fr.=A. PSEUDO-CLYPEATUS. Bolt. t. 154.
120 A. ALCALINUS. Fr. E.F. 145.

V. *FILOPEDES.*

121 A. FILOPES. Bull. E.F. 142.
122 A.†IRIS, Berk. E. F. 143.
123 A.†PAUPERCULUS. Berk. E.F. 144.
124 A. VITILIS. Bull.=A. TENUIS. Sow. t. 385. f. 5.

VI. *LACTIPEDES.*

125 A. CRUENTUS. Fr. Sow t. 385 f. 2, 3.
126 A. SANQUINOLENTUS. Alb. and Schw. E.F. 149.
127 A. CROCATUS. Schrad. An. 672.
128 A. CHELIDONIUS. Fr.=A. PUMILUS. Sow. t. 385 fig. 4.
129 A. GALOPUS. Pers. E.F. 148.

VII. *GLUTINIPEDES.*

130 A. EPITERYGIUS. Scop. E.F. 159.
131 A.†CAMPTOPHYLLUS. Berk. E.F. 160.
132 A. VULGARIS. Pers. An. 46.
133 A. RORIDUS. Fr E.F. Appendix.

VIII. *BASIPEDES.*

134 A. STYLOBATES. Pers. E.F. 156.
135 A. DILATATUS. Fr.
CLAVULARIS. Bats.=A. TENERRIMUS. Berk. E.F. 157.
136 A. PTERIGENUS. Fr. E.F. 164. An. 47.

IX. *INSITITIÆ.*

137 A. HIEMALIS. Retz.=A. CORTICOLA. E.F. 161 syn.
138 A. SETOSUS. Sow. E.F. 166.
139 A. CAPILLARIS. Schum. E.F. 165.
140 A. JUNCICOLA. Fr. E.F. 163.

Sub-genus 8. OMPHALIA.

I. *COLLYBIAREÆ.*

141 A. PYXIDATUS. Bull. E.F. 170. An. 144.
142 A.†SPHAGNICOLA. Berk. E.F. 174.
143 A.†RUFULUS. Berk. An. 325.
144 A. ONISCUS Fr.=A. CÆSPITOSUS. Bolt. t. 41.

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145 A.†Belliæ. Johnst. MSS. An. 143.
146 A. muralis. Swartz. E.F. 171 syn?
147 A. umbelliferus. L. E.F. 172. An. 267.
148 A.†helvelloides. Bull. An. 324.
149 A. stellatus. Fr. E.F. 168. An. 268.

II. *MYCENARIÆ.*

150 A. campanella. Batsch. E.F. 173.
151 A. griseus. Fr. An. 141.
152 A. fibula. Bull. E.F. 169.
153 A. integrellus. Pers. E. 167. An. 142.

Sub-genus 9. PLEUROTUS.

I. *EXCENTRICI.*

154 A. dryinus. Pers. E.F. 182.
155 A. ulmarius. Bull. E.F. 192.
156 A. fimbriatus. Bolt. E.F. 90. An. 672.
157 A. glandulosus. Bull. E.F. 185.
158 A. ostreatus. Jacq. E.F. 186.
159 A.†euosmos. Huss. An. 326.
160 A. salignus. Pers. E.F. 187.

II. *DIMIDIATI.*

161 A. petaloides. Bull. E.F. 188.
162 A. mitis. Pers. E.F. 195. An. 48.
163 A. tremulus. Schœff. E.F. 197.
164 A. acerosus. Fr. An. 673.

III. *RESUPINATI.*

165 A. porrigens. Pers. E.F. 189,
166 A. septicus. Fr. E.F. 198.
167 A. mastrucatus. Fr. E.F. 196.
168 A.†Leightoni. Berk. An. 270.
169 A. atrocœruleus. Fr. An. 674.
170 A. applicatus. Batsch. E.F. 201.
171 A. striatulus. Pers. E.F. 202.

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Series II. Hyporhodii.

Sub-genus 10. VOLVARIA.

172 A. BOMBYCINUS. Schœff. E.F. 281.
173 A. VOLVACEUS. Bull. E.F. 282,
174 A. LOVEIANUS. Berk. E.F. 283.
175 A. SPECIOSUS. Fr. E.F. Appendix.
176 A. MEDIUS. Schum. E.F. 284.
177 A. GLOIOCEPHALUS. Dec. An. 5. ?
178 A.† TAYLORI. Berk. An. 675.

Sub-genus 11. PLUTEUS.

179 A. CERVINUS. Schœff. = A. PLUTEUS. E.F. 211.
180 A. NANUS. Pers. An. 676.
181 A. PETASATUS. Fr. An. 271.
182 A. LEONINUS. Schœff. E.F. 209.
183 A. CHRYSOPHÆUS. Schœff. = A. MOLLIUSCULUS. Sow. t. 171.
184 A. PHLEBOPHORUS. Ditm. E.F. 212. An. 676.

Sub-genus 12. ENTOLOMA.

I. *GENUINI.*

185 A.† BLOXAMI. Berk. An. 677.
186 A. MADIDUS. Fr. = A. PURPUREUS. Bolt. t. 41. f. B.
187 A. ARDOSIACUS. Bull. E.F. 208.

II. *LEPTONIDEI.*

188 A. GRISEO-CYANEUS. Fr. E.F. 213.
189 A. SERICELLUS. Fr. E.F. 204.

III. *NOLANIDEI.*

190 A. CLYPEATUS. L. = A. FERTILIS. E.F. 206. syn.
var. MAMMOSUS. Bolt. E.F. 207.
191 A. RHODOPOLIUS. Fr. E.F. 205.
192 A. COSTATUS. Fr. An. 679.

Sub-genus 13. CLITOPILUS.

193 A. PRUNULUS. Scop. E.F. 203.

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Sub-genus 14. LEPTONIA.

194 A. LAMPROPUS. Fr. An. 145.
195 A. SERRULATUS, Fr. An. 146.
COLUMBARIUS. Bull. E.F. 215.
196 A. CHALYBEUS. Pers. E.F. 214.
197 A. INCANUS. Fr = A. SOWERBEI Berk. E. F. 217.

Sub-genus 15. NOLANEA.

198 A.†BABINGTONII. Blox. An. 680.
199 A. PASCUUS. Pers. E.F. 216.

Sub-genus 16. ECCILIA.

200 A†RUFO-CARNEUS. Berk. E.F. 218.

SERIES III. **Dermini.**

Sub-genus 17. PHOLIOTA.

I. *HUMIGENEI.*
201 A. AUREUS. Mathusk. E F. 241.
202 A. DURUS. Bolt. An. 327.
203 A. PRÆCOX. Pers. E.F. 287.
204 A. SPHALEROMORPHUS. Bull. E.F. 287.
II. *TRUNCIGENEI.*
205 A. RADICOSUS. Bull. E.F 243.
206† A. JECORINUS. Berk. An. 328.
207 A. PUDICUS. Fr. = A. CAPERATUS. E. F. 242.
208 A. COMOSUS. Fr. = A. VILLOSUS. Bolt. t. 42. E.F. 244. syn.
209 A. AURIVELLUS. Batsch. E.F. 244. An. 680.
210 A. SQUARROSUS. Müll. E.F. 246.
211 A. ADIPOSUS. Batsch. E.F. 245.
212 A. FLAMMANS. Batsch. E.F. 247.
213 A. MUTABILIS. Schœff. E.F. 248.
III- *MUSCIGENEI.*
214 A.†MESODACTYLIUS. Berk. An. 329.
215 A. MYCENOIDES. Fr. An. 681.

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Sub-genus 18. HEBELOMA.

I. *SQUARROSI.*

216 A. RELICINUS. Fr. F.F. 259.

217 A. LANUGINOSUS. Bull. F.F. 261.

218 A.†FLOCCULOSUS. Berk. F.F. 262.

219 A. PLUMOSUS. Bolt. F.F. 260.

220 A. FIBROSUS. Sow. E.F. 256.

II. *LACERI.*

221 A. PYRIODORUS. Pers E.F. 257.

222 A. SCABER. Müll. E.F. 258.

223 A. MARITIMUS. Fr. H.H.H.

224 A. OBSCURUS. Pers. An. 682.

III *RIMOSI.*

225 A. REPANDUS. Bull. E.F. 210. An. 676.

226 A. RIMOSUS. Bull. E.F. 263.

227 A.†HOOKERI. Klotzsch. E.F. 264.

IV. *VELUTINI.*

228 A. SAMBUCINUS. Fr. Sow. t. 414?

229 A. GEOPHYLLUS. Sow. E.F. 265.

V. *INDUSIATI.*

230 A. FASTIBILIS. Pers. E. F. 251.

VI. *DENUDATI.*

231 A. CRUSTULINIFORMIS. Bull. E.F. 251. Syn. H.H.H.

232 A. ELATUS. Batsch. E.F. 250.

Sub-genus 19. FLAMMULA.

233 A. VINOSUS. Bull. Bolt. t. 55.

234 A. LENTUS. Pers. E.F. 255.

235 A. FUSUS. Batsch.=A. POMPOSUS. Bolt. t. 5. E.F. 292. syn.

236 A. FLAVIDUS. Schœff. E.F. 252. An. 330.

237 A. INOPUS. Fr. E.F. 253.

308 A. SAPINEUS. Fr. E.F. 254.

Sub-genus 20. NAUCORIA.

I. *GYMNOTI.*

239 A. CUCUMIS. Pers. E.F. 269.

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240 A. CENTUNCULUS. Fr. An. 72.
241 A. HORIZONTALIS. Bull. E.F. 162. An. 331.
242 A. NUCEUS. Bolt. t. 70.
243 A. MELINOIDES. Bull. E.F. 272.

II. *PHÆOTI.*

244 A. VERVACTI. Fr. An. 273.
245 A. PEDIADES. Fr. An. 683.
246 A. SEMIORBICULARIS. Bull. An. 274.
247 A. INQUILINUS. Fr. E.F. 268.

III. *LEPIDOTI.*

248 A. FURFURACEUS. Pers. E.F. 267.
249 A. ERINACEUS. Fr. E.F. 266.
250 A. SIPARIUS. Fr. An. 684.

Sub-genus 21. GALERA.

251 A. PILIPES. Sow. E.F. 158.
252 A. LATERITIUS. Fr. E.F. 270.
253 A. TENER. Schœff. E.F. 271.
254 A. CONFERTUS. Bolt. t. 18.
255 A. SPARTEUS. Fr.=A. ATRO-RUFUS. Bolt. t. 51. fig. 1.
256 A. HYPNORUM. Batsch. E.F. 273. syn.

Sub-genus: CREPIDOTUS.

257† A. CHEIMONOPHILUS. Berk An. 687.

I. *EUDERMINI.*

258 A. PALMATUS.* Bull. E.F. 193.
259 A. ALVEOLUS. Lasch. An. 685.
260 A. MOLLIS. Schœff. E.F. 276.
261† A. CHIONEUS. Pers. E.F. 200.
262 A. HAUSTELLARIS. Fr. E.F. 277.
263† A. RUBI. Berk. E.F. 278.

II. *HYPODERMINI.*

264 A. VARIABILIS. Pers. E.F. 279.
265 A. DEPLUENS. Batsch. An. 73.=A. HYPNOPHILUS. P. E.F. 199.

* See on A. subpalmatus. Epicrisis. p. 131.

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266 A. BYSSISEDUS. Pers. An. 686.
267 A. PEZIZOIDES. Nees. E.F. 280

SERIES IV. **Pratellæ.**

Sub-genus 23. PSALLIOTA.

I. *LEPIOTIDEÆ.*

268 A. CAMPESTRIS. L. E.F. 286.
269 A. ARVENSIS. Schœff.=A. GEORGII. E.F. 285.
270 A. CRETACEUS. Fr. An. 148.
271 A. ECHINATUS. Roth. An. 147.

II. *PHOLIOTIDEI.*

272 A. VERSICOLOR. With. E.F. 289.
273 A. ÆRUGINOSUS. Curt. E.F. 290.
274 A. SQUAMOSUS. Fr. E.F. appendix.
375 A. STERCORARIUS. Fr. An. 688. E.F. 294. ?
376 A. SEMIGLOBATUS. Batsch. E.F. 288.

Sub-genus 24. HYPHOLOMA.

I. *TENACES.*

277 A. SUBLATERITIUS. Fr.=A. LATERITIUS. E.F. 292.
278 A. FASCICULARIS. Huds. E.F. 293.

II. *HYGROPHILI.*

279 A. LACHRYMABUNDUS. Bull. E.F. 291.
280 A. VELUTINUS. Pers. Sow. t. 41.
281 A. CANDOLLIANUS. Fr. E.F. 299.
282 A. APPENDICULATUS. Bull. Sow. t. 324.

Sub-genus 25. PSILOCYBE.

I. *RIGIDI.*

283 A. †AREOLATUS. Klotzsch. E.F. 297.
284 A. SPADICEUS.* Schœff.=A. STIPATUS. E.F. 298.
POLYCEPHALUS. Bolt. t. 11.

* A. PAPYRACEUS. Pers. E. F. 314, is referred to this species. see on A. OBTUSATUS. Epicrisis, p. 232.

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285 A. CERNUUS. Fr. E.F. 302.
286 A. †BIFRONS. Berk. E.F. 303.
287 A. SQUALENS. Fr.=A PLANUS. Sow. 302.
288 A. FŒNISECII. Pers. E.F. 296.

II. *TENACES.*

289 A. ERICÆUS. Pers. An. 149.
290 A. COPROPHILUS. Bull. An. 689.
291 A. BULLACEUS. Bull. E.F. 301.
292 A. PHYSALOIDES. Bull. An. 690
293 A. CALLOSUS. Fr. E.F. 295.
294 A. SEMILANCEATUS. Fr. Sow. 248. f. 1-3.

Sub-genus 26. PSATHYRA.

295 A. CORRUGIS. Pers. E.F. 305.
296 A. FIBRILLOSUS. Pers. E.F. 300.
297 A. GOSSYPINUS. Fr.=A. AQUOSUS. Bolt. t. 71 f. 1.
298 A. NOLI-TANGERE. Fr.=A. XYLOPHILUS. Sow. t. 167.

SERIES V. **Coprinarii.**

Sub-genus 27. PANÆOLUS.

299 A. SEPARATUS. Fr.=A. SEMIOVATUS. Sow. E.F. 307.
300 A. FIMIPUTRIS. Bull. E.F. 308.
301 A. PAPILIONACEUS. Bull. E.F. 309.
302 A. CINCTULUS. Bolt. t. 152.
304 A. FIMICOLA. Fr.=A. VARIUS. Bolt. t. 66. f. 1.

Sub-genus. PSATHYRELLA.

305 A. GRACILIS. Pers. E.F. 306.
306 A. ATOMATUS. Fr. E.F. 304.
307 A. DISSEMINATUS. Pers. E.F. 315.

Genus 2. COPRINUS.

I. *PELLICULOSI.*

308 C. COMATUS. Bat. E.F. 316. syn.

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309 C. STERQUILINUS. Fr. E.F. 317. An 150.
310 C. OBLECTUS. Bolt. t. 142.
311 C. ATRAMENTARIUS. Bull. E.F. 319.
312 C. LURIDUS. Bolt. t. 25.
313 C. PICACEUS. Bull. E.F. 318.
314 C. APTHOSUS. Fr.=A. DOMESTICUS. Bolt. E.F. 324.
315 C. EXSTINCTORIUS. Fr. Bolt. t. 24.
316 C. FIMETARIUS. L.=A. CINEREUS. Bull. E.F. 321.
MACRORHIZUS. Pers. E.F. 322.
PULLATUS.=A. STERCORARIUS. Sow. t. 262.
317 C. TOMENTOSUS. Bull. Bolt. t. 156. E.F. 321 syn.
318 C. NIVEUS. Pers. E.F. 323.
319 C. MICACEUS. Bull. E.F. 320.
320 C. RADIANS. Desm. E.F. 325.

II. *VELIFORMES.*

321 C. HENDERSONI. Berk. E.F. 328.
322 C. RADIATUS. Bolt. E.F. 331.
323 C STERCOREUS. Fr.=A. STERCORARIUS. Bull. E.F. 329.
324 C. EPHEMERUS. Bull. E.F. 330.
325 C. †MACROCEPHALUS. Berk. E.F. 326.
326 C. PLICATILIS. Sow. E.F. 327.
STRIATUS. Bull. E.F. 310.
327 C. HEMEROBIUS. Fr.=A CAMPANULATUS. Bolt. t. 31

Genus 3. BOLBITIUS.

328 B. VITELLINUS. Pers. E.F. 311.
329 B. BOLTONI. Pers. E.F. 312. Bolt. t. 149.
330 B. FRAGILIS. L.=A. EQUESTRIS. Bolt. t. 65.
331 B. TITUBANS. Bull. E.F. 313.

Genus 4. CORTINARIUS.

Sub-genus 1. PHLEGMACIUM.

332 C. CAPERATUS. Fr. An. 691.
333 C. VARIUS. Schœff. E.F. 233.

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334 C. CYANOPUS. Secr.=A. GLAUCOPUS. Sow. 223.
335 C. ANFRACTUS. Fr. An. 692.
336 C. MULTIFORMIS. Fr.=A. TURBINATUS. Sow. t. 102. E.F. 233 syn.
337 C. GLAUCOPUS. Schœff. An. 4.
338 C. CALLOCHROUS. Pers. E.F. 231, and E.F. 232, descrip.
339 C. CŒRULESCENS.* Schœff.=A. CYANUS. Pers. An. 68.
340 C. TURBINATUS. Bull. E.F. appendix.
341 C. SCAURUS. Fr. E.F. 230.

Sub-genus 2. MYXACIUM.

342 C. COLLINITUS. Sow. E.F. 249.

Sub-genus 3. INOLOMA.

343 C. VIOLACEUS. L. E.F. 227.
344 C. HIRCINUS. Fr.=A. VIOLACEUS. Bolt. t. 52.
345 C. BULLIARDI. Pers. An. 693.
346 C. BOLARIS. Pers. An. 69.
347 C. PHOLIDEUS. Fr. An. 272.
348 C. SUBLANATUS. Sow. E.F. 225.

Sub-genus 4. DERMOCYBE.

349 C. MYRTILLINUS. Fr.=A. BULBOSUS. Bolt. t. 147.
350 C. ANOMALUS. Fr. E.F. 229.
351 C. SPILOMEUS. Fr. E.F. 228.
352 C. SANGUINEUS. Jacq. E.F. 234.
353 C. CINNAMOMEUS. L. E.F. 235.
CROCEUS. Schœff. An. 49.
354 C. RAPHANOIDES. Pers. E.F. 236.

Sub-genus 5. TELAMONIA.

355 C. BULBOSUS. Sow. E.F. 226.
356 C. TORVUS. Fr. E.F. 219.
357 C. EVERNIUS. Fr. E.F. 221.

* See Epicrisis on C. Cyanites, p. 279

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358 C. LIMONIUS. Fr. E.F. 223.
359 †C. VALIDUS. Berk. E.F. 224.
360 C. HINNULEUS. Sow. t. 173. E.F. 222. syn.
361 C. GENTILIS. Fr. E.F. 222.
362 C. BRUNNEUS. Pers. E.F. 220.
363 C. PERISCELIS. Fr. An. 694.
364 C. PSAMMOCEPHALUS. Bull. An. 695.
365 C. ILIOPODIUS. Bull. E F. 237.

Sub-genus HYDROCYBE.

366 C. ARMENIACUS. Schœff. E.F. 238. An. 696.
367 C. DILUTUS. Pers.=A. CASTANEUS. Bolt. t. 10.
368 C. CASTANEUS. Bull. E.F. 239.
369 †C. LIVIDO-OCHRACEUS. Berk. E.F. 240.

Genus 5. PAXILLUS.

370 P. INVOLUTUS. Batsch. E.F. 274.
371 P. FILAMENTOSUS. Scop.=A. ADSCENDENTIBUS. Bolt. t. 55.?
372 P. ATROTOMENTOSUS. An. 697.
373 P. PANUOIDES. Fr. E.F. 275.

Genus 6. GOMPHIDIUS.

374 G. GRACILIS. Berk. An. 698.
375 G. GLUTINOSUS. Schœff. E.F. 332.
376 G. VISCIDUS. L.=A. RUTILUS. Schœff. E.F. 333.

Genus 7. HYGROPHORUS.

Sub-genus 1. LIMACIUM.

377 H. CHRYSODON. Batsch. An. 258.
378 H. EBURNEUS. Bull. E.F. 22.
379 H. COSSUS. Sow. E.F. 23.
380 H. PENARIUS. Fr.=A. NITENS. Sow. An 40.
381 H. ERUBESCENS. Fr. An. 39.

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382 †H. CERASINUS. Berk. E.F. 21.
383 H. HYPOTHEJUS. Fr. E.F. 25.
384 H. OLIVACEO-ALBUS. Fr. E.F. 24.
385 †H. MESOTREPHUS. Berk. An. 699.

Sub-genus 2. CAMAROPHYLLUS.

386 H. CAPRINUS. Scop.=A. CAMAROPHYLLUS. Alb. & Schw. E.F. 93.
A. ELIXUS. Sow. t. 172. An. 264.?
387 H. LEPORINUS. Bat. An. 700.
388 H. PRATENSIS. Pers. E.F. 94.
389 H. VIRGINEUS. Wulf. E.F. 95.
390 †H. RUSSO-CORIACEUS. Berk. An. 332.
391 H. OVINUS. Bull. An. 262.

Sub-genus 3. HYGROCYBE.

392 H. COLEMANNIANUS. Blox. An. 701.
393 H. LÆTUS. Fr. An. 702.
394 H. CERACEUS. Wulf. E.F. 97.
395 H. COCCINEUS. Wulf. E.F. 100.
396 H. MINIATUS. Fr. E.F. 101.
397 H. PUNICEUS. Fr. E.F. 99.
398 H. OBRUSSEUS. Fr.=A. LACERATUS. Bolt. t. 68.
399 H. CONICUS. Schœff. E.F. 98.
400 †H. CALYPTRÆFORMIS. Berk. An. 63.
401 H. PSITTACINUS. Schœff. E.F. 96.
402 H. UNGUINOSUS. Fr. An. 62.
403 H. MURINACEUS.* Bull. E.F. 108. An. 261.

Genus 8. LACTARIUS.

I. *PIPERITES.*

404 L. TORMINOSUS. Schœff. E.F. 51 & 53. cfr. An. 703.
405 L. CILICIOIDES. Fr. E.F. 52.

* H. MURINACEUS of Fries is not A. MURINACEUS of Bulliard according to the Rev. M. J. Berkeley, who refers the latter plant, figured by Sow. t. 106, to the vicinity of A. ARGYRACEUS.

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406 L. TURPIS. Weinm. An. 703.
407 L. BLENNIUS. Fr. E.F. 58.
408 L. HYSGINUS. Fr. E.F. 57.
409 L. CIRCELLATUS. Fr.=A. ZONARIUS. Sow. E.F. 54. syn.
410 L. UVIDUS. Fr. E.F. 56.
411 L. FLEXUOSUS. Pers. E.F. 69.
412 L. PYROGALUS. Bull. E.F. 68
413 L. PLUMBEUS. Bull. E.F. 66
414 L. PIPERATUS. Scop. E.F. 70
415 L. VELLEREUS. Fr. E.F. 71

II. *DAPETES.*

416 L. DELICIOSUS. L. E.F. 59

III. *RUSSULARES.*

417 L. THEIOGALUS. Bull. E.F. 63 An. 704
418 L. CHRYSORHEUS. Fr. An. 704
419 L. ACRIS. Bolt. E.F. 55
420 L. PALLIDUS. Pers. An. 705
421 L. QUIETUS. Fr. E.F. 61
422 L. AURANTIACUS. Fr. H.H.H.
423 L. VOLEMUS. Fr. 60
424 L. SUBDULCIS. Bull. E.F. 62
425 L. CAMPHORATUS. Bull. An. 706
426 L. RUFUS. Scop. E.F. 64
427 L. GLYCIOSMUS. Fr. E.F. 65
428 L. FULIGINOSUS. Fr. E.F. 67

Genus 9. RUSSULA.

I. *COMPACTÆ.*

429 R. NIGRICANS. Bull.=A. ADUSTUS. Pers. E.F. 50
CRASSA.=A. ELEPHANTINUS. Sow. t. 36
430 R. ELEPHANTINA. Bolt. t. 28?

II. *FIRMÆ.*

431 R. FURCATA. Pers. E.F. 48 syn.
432 R. VESCA. Fr.=A. EMETICUS. E.F. 45 syn.
433 R. HETEROPHYLLA. Fr.=A. VIRESCENS. E.F. 49 syn.

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III. *RIGIDÆ.*

434 R. RUBRA. Lam. E.F. 46.

IV. *FRAGILES.*

435 R. EMETICA. Fr. An. 333.
436 R. OCHROLEUCA. Pers. A. 707.
437 R. FOETENS. Pers. E.F. 47.
438 R. INTEGRA. L. An. 334.
439 R. AURATA. With. An. 335.
440 R. DECOLORANS. Fr. An. 60.
441 R. NITIDA. Pers. E.F. 44.
442 R. ALUTACEA. Pers. E.F. 42.
443 R. LUTEA. Huds. E.F. 43.

Genus 10. CANTHARELLUS.

I. *MESOPUS.*

444 C. CIBARIUS. Fr. E.F. p. 125.
445 C. AURANTIACUS. Fr. E.F. p. 124.
446 †C. BROWNII. Berk. An. 336.
447 C. INFUNDIBULIFORMIS. Scop. = C. TUBÆFORMIS. Bull. E.F. p. 125. Sow. t. 47.
448 C. CINEREUS. Pers. E.F. p. 126.

II. *PLEUROPUS.*

449 C. MUSCIGENUS. Bull. E.F. p. 127.

III. *RESUPINATUS.*

450 C. LOBATUS. Fr. E.F. p. 127.

Genus 11. NYCTALIS

451 N. PARASITICA. Bull. E.F. 132.

Genus 12. MARASMIUS.

452 †M. STEPHENSII. Berk. An. 708.

Sub-genus 1. COLLYBIA.

I. *SCORTEI.*

453 M. URENS. Fr. An. 275.

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454 M. PERONATUS. Bolt. E.F. 119.
455 M. PORREUS. Fr. E.F. 121.
456 M. OREADES. Bolt. E.F. 120.

II. *TERGINI.*

457 M. FUSCO-PURPUREUS Pers. E.F. 122. An. 41.
458 M. ERYTHROPUS. Pers. An. 65.
459 M. ARCHYROPUS. Pers. An. 276.

III. *CALOPODES.*

460 M. SCORODONIUS. Fr. E.F. 123.
461 M. CALOPUS. Pers. An. 266.
462 M. VAILLANTII. Fr. E.F. 133. An. 66.
463 M. FOETIDUS. Sow. E.F. 137.
464 M. AMADELPHUS. Bull. An. 277.
465 M. RAMEALIS. Bull. E.F. 131.
466 M. CANDIDUS. Bolt. t. 39.

Sub-genus 2. MYCENA.

I. *CHORDALES.*

467 M. ALLIACEUS. Jacq. E.F. 140.
468 M. CAUTICINALIS. Sow. t. 164.

II. *ROTULÆ.*

469 M. ANDROSACEUS. L. E.F. 135.
470 M. ROTULA. Scop. F.F. 134.
471 M. HUDSONI. Per. E.F. 139. An. 708.
472 M. EPIPHYLLUS. Pers. E.F. 138.

Genus 13. LENTINUS.

473 L. TIGRINUS. Bull. E.F. 179.
474 L. DUNALII. Dec. E.F. 178.
475 L. LEPIDEUS. Fr. E.F. 180.
476 L. ADHÆRENS. Alb. and Schw. E.F. 91.
477 L. COCHLEATUS. Pers. E.F. 181.
478 †L. INCONSTANS. Pers. E.F. 183.
479 L. FLABELLIFORMIS. Bolt. E.F. 190.
480 L. VULPINUS. Sow. E.F. 191.

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Genus 14. PANUS.

481 P. TORULOSUS. Fr.=A. CARNOSUS. Bolt. t. 146.?
482 P. CONCHATUS. Fr. E.F. 184 syn. An. 67.
483 P. STYPTICUS. Bull. E.F. 194.

Genus 15. XEROTUS.

484 X. DEGENER. Schœff.=A. TURFOSUS. Sow. t. 210.

Genus 16. SCHIZOPHYLLUM.

485 S. COMMUNE. Fr. E.F. p. 130.

Genus 17. LENZITES.

486 L. BETULINA. L.=DÆDALIA. BETULINA. E.F. p. 131.
487 L. SEPIARIA. Fr. An. 337.
488 L. ABIETINA. Fr.=DÆDALIA. ABIETINA. E.F. 132.

FAM. 2. *POLYPOREI.* Fries.

Genus 18. BOLETUS.

Sub-genus 1. OCHROSPORUS.

1 B. LUTEUS. L. E.F. 1.
2 B. ELEGANS. Fr.=B. LUTEUS. Grev. t. 183. E.F. 1. syn. FLAVUS=B. GREVILLEI. E.F. 2.
3 †B. LARICINUS. Berk. E.F. 3.
4 B. GRANULATUS. L. E.F. 4.
5 B. BOVINUS. L. E.F. 5.
6 B. SANGUINEUS. With. Sow. t. 225. E.F. 8. var. b.
7 B. PARASITICUS. Bull. An. 338.
8 B. VARIEGATUS. Fr.
GUTTATUS. Pers.=B. VARIEGATUS. Sw. E.F. 7.

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9 B. CHRYSENTHERON. Bull. An. 339.
10 B. SUBTOMENTOSUS. L. E.F. 8.
11 B. CALOPUS. Fr. Bolt. t. 84, media.
12 B. PACHYPUS. Fr. E.F. 10.
13 B. SATANAS. Lenz. An. 340.
14 B. LUPINUS. Fr. Sow. t. 250.?
15 B. LURIDUS. Schœff. E.F. 11.
16 B. PURPUREUS. Fr. An. 341.
17 B. EDULIS. Bull. E.F. 13.

Sub-genus 2. DERMINUS.

18 B. STROBILACEUS. Scop. E.F. 15.
19 B. VISCIDUS. L. An. 278.
20 B. VERSIPELLIS. Fr. Sow. t. 110. E.F. 14 syn.
21 B. SCABER. Fr.
var. b.=B. SCABER. Bull. E.F. 14.

Sub-genus 3. HYPORHODIUS.

22 B. ALUTARIUS. Fr. An. 342.
23 B. FELLEUS. Bull. An. 79.

Sub-genus 4. LEUCOSPORUS.

24 B. CYANESCENS. Bull. E.F. 16.
25 B. CASTANEUS. Bull. E.F. 12.

Genus 19. POLYPORUS. Mich.

Sub-genus 1. MESOPUS.

I. *LENTI.*

26 †P. LENTUS. Berk. E.F. 1.
27 P. BRUMALIS. Fr. E.F. 4. An. 343.
28 P. FUSCIDULUS. Fr.=BOL. SUBSTRICTUS. Bolt. t. 170.
29 P. LEPTOCEPHALUS. Jacq. E.F. 5.

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II. *SPONGIOSI.*

30 P. RUFESCENS. Fr.=BOL. BIENNIS. Sow. t. 191.?

31 P. BIENNIS. Bull. E.F. DÆD 1.

III. *BIENNES.*

32 P. PERENNIS. L. E.F. 6.

Sub-genus 2. PLEUROPUS.

I. *LENTI.*

33 P. SQUAMOSUS. Huds. E.F. 2.

34 P. ROSTKOVII. Fr. An. 709.

35 P. PICIPES. Fr.=P. VARIUS. Grev. t. 202.

36 P. VARIUS. Pers. E.F. 7.

37 P. ELEGANS. Bull.=BOL. LATERALIS. Bolt, t. 83.
var. NUMMULARIUS. Bull. t. 124. H.H.H.

II. *LIGNOSI.*

38 P. QUERCINUS. Schrad. An. 344

39 P. LUCIDUS. Leyss. E.F. 8.

Sub-genus 3. MERISMA.

I. *CARNOSI.*

40 P, FRONDOSUS. Schr. Fl. Dan. t. 952. E.F. 9.

41 P. INTYBACEUS. Fr.=BOL. FRONDOSUS. Sow. t. 87. ?

42 P. CRISTATUS. Schœff. E.F, 11.

II. *LENTI.*

43 P. GIGANTEUS. Pers. E.F. 10.

III. *CASEOSI.*

44 P. SULPHUREUS. Bull. E.F. 12.

45 P. IRREGULARIS. Sow. E.F. 18.

IV. *SUBEROSI.*

46 P. CRASSUS. Fr. H.H.H.

47 P. HETEROCLITUS. Bolt. E.F. 3,

48 P. SALIGNUS. Fr.=P. SALICINUS. Grev. E.F. 21. An. 346.

Sub-genus 4. APUS.

Anodermei.

I. *CARNOSI.*

49 P. FRAGILIS. Fr. An. 710.

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50 P. MOLLIS. Fr. H.H.H.
51 P. CÆSIUS. Schrad. E.F. 15.
II. *LENTI.*
52 P. NIDULANS. Fr. An. 345.
var. SPONGIOSUS=BOL. RESUPINATUS. Bolt. t. 165.
53 RUTILANS. Fr. An. 346.
54 P. GILVUS. Schw.=BOL. IMPUBER. Sow. t. 195.
55 P. ADUSTUS. Willd. E.F. 16.
56 P. CRISPUS.* Fr. H.H.H.
57 P.† ADIPOSUS. Berk. An. 711.
58 P. AMORPHUS. Fr. E.F. 17.
II. *SPONGIOSI.*
59 P. HISPIDUS. Bull. E.F. 13.
60 P. SPUMEUS. Sow. E.F. 14. An. 78.

Placodermei.

IV. *SUBEROSI.*
61 P. DRYADEUS. Pers. E.F. 32.
62 P. BETULINUS. Bull. E.F. 19.
63 P. GIBBOSUS. Pers.=BOL. SUBEROSUS. Sow.=P. CYTISINUS. E.F. 28.
64 P. PALLESCENS. Fr. E.F. 24.
V. *FOMENTARII.*
65 P. FOMENTARIUS. L. E.F. 33.
66† P. SCOTICUS. Klotsch. E.F. 27.
67 P. NIGRICANS. Fr. E.F. 34.
68 P. IGNIARIUS. L. E.F. 35.
69 P. RIBIS. Schum. E.F. 36.
70 P. CONCHATUS. Pers. E.F. 37.
71 P. SALICINUS. Fr. An. 346.
72 P. CINNAMOMEUS. Trog.=BOL. IGNIARIUS. Bolt. t. 80.
73 P. PINICOLA. Sw. E.F. 31.
74 P. ULMARIUS. Sow. E.F. 26.
VI. *LIGNOSI.*
75 P. FRAXINEUS. Bull. E.F. 29.
76 P. VARIEGATUS. Sow. t. 368.

* Identified by the Rev. M. J. Berkeley.

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Inodermei.

VII. *STUPOSI.*

77 P. RADIATUS. Sow. t. 196. E.F. 30.
78 P. CERVINUS. Fr. An. 347.
79 P. RAVIDUS. Fr.=BOL. HETEROCLITUS. Sow. 367.
80 P. FIBULA. Sow. t. 387. f. 8.

VIII. *CORIACEI.*

81 P. VELUTINUS. Pers. E.F. 22.
82 P. ZONATUS. Fr. H.H.H.?
83 P. VERSICOLOR. L. E.F. 23.
FUSCATUS.=BOL. UNICOLOR. Bolt. t. 163.
84 P. ABIETINUS. Pers. E.F. 25.

Sub-genus 5. RESUPINATUS.

85†P. ARMENIACUS. Berk. E.F. 45.
86†P. CELLARIS. Desm. An. 348.
87 P. FERRUGINOSUS. Schrad. E.F. 39.
88 P. NITIDUS. Pers. An. 349.
89 P. BOMBYCINUS. Fr. An. 350.
90 P. INCARNATUS. Pers. E.F. 40.
91 P. MEDULLA-PANIS. Jacq. E.F. 41.
92 P. VITREUS. Pers. An. 351.
93 P. OBDUCENS. Pers. An. 352.
94 P. VULGARIS. Fr. E.F. 42 syn.
95 P. MOLLUSCUS. Pers. E.F. 44.
96 P. TERRESTRIS. Pers. An. 355.
97†P. STEPHENSII. Berk. An. 356.
98 P. VAPORARIUS. Pers. An 354.
99 P. ANEIRINUS. Fr. An 353.
100 P. VAILLANTII. Dec. E.F. 43.

Genus 20. TRAMETES. Fries.

101 T. SUAVEOLENS. L. E.F. POL. 20.
102 T. ODORA. Fr.=BOL. SUBEROSUS. Bolt. t. 162.

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103 T. Bulliardi. Fr=DÆD. suaveolens. E.F.
104 T. rubescens. Alb. & Schw. An. 711.
105 T. gibbosa. Pers. E.F. DÆD. 10.

Genus 21. DÆDALEA. Pers.

106 D. quercina. L. E.F. 2.
107 D. confragosa. Pers. E.F. 7. An. 279.
108 D. angustata. Sow. E.F. 11.
109 D. unicolor. Bull. E.F. 8.
110 D. latissima. Fr. E.F. 12.

Genus 22. MERULIUS. Haller.

I. *LEPTOSPORI.*

111† M. pallens. Berk. An. 151.
112 M. tremellosus. Schrad. An. 77.
113 M. corium. Grev. E.F. 1.
114 †M. aurantiacus. Klotsch. E.F. 2.
115 M. himantioides. Fr.=BOL. arboreus. Sow. t. 346?
116 M. molluscus. Fr. An. 712.
117 M. †Carmichaelianus. Grev. E.F. 5.
118 M. porinoides. Fr. An. 358.

II. *CONIOPHORI.*

119 M. lachrymans. Wulf. E.F. 3.
120 M. pulverulentus. Sow. E.F. 4.

Genus 23. POROTHELIUM. Fries.

121 P. fimbriatum. Pèrs. Sow. t. 387. f. 1. 2
122 P. Friesii. Mont. An. 359.

Genus 24. FISTULINA. Bulliard.

123 F. hepatica. With. E.F. 1.

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Fam. 3 *HYDNEI.* Fries.

Genus 25. HYDNUM. L.

Sub-genus 1. MESOPUS.

I. *CARNOSA.*

1 H. IMBRICATUM. L. E.F. 1.
2 H. REPANDUM. L. E.F. 2.
3 H. RUFESCENS, Schœff.=H. REPANDUM. Bolt. t. 89.

II. *LIGNOSA.*

4 H. COMPACTUM. Pers. E.F. 3.
5 H. ZONATUM. Batsch. An. 360.
6 H. GRAVEOLENS. Delastre. An. 280.

Sub-genus 2. PLEUROPUS.

7 H. AURISCALPIUM. L. E.F. 4.

Sub-genus 3. MERISMA.

8 H. CORALLOIDES. Scop. E.F. 6.
9 H. ERINACEUS. Bull. E.F. 5.

Sub-genus 4. APUS.

10† H. FUSCUM. Pers. E.F. 9.
11 H. OCHRACEUM. Pers. E.F. 8.

Sub-genus 5. RESUPINATUS.

12 H. MEMBRANACEUM. Bull. E.F. 10.
13 H. WEINMANNI. Fr. An. 713.
14 H. FERRUGINOSUM. Fr.=H. FERRUGINEUM. Pers. E.F. 11.
15 H. ALUTACEUM. Fr. An. 714.
16 H. SPATHULATUM. Fr. An. 281.
17 H. UDUM. Fr. E.F. 15.
18 H. NIVEUM. Pers. An. 361.
19 H. FARINACEUM. Pers. E.F. 12.

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Genus 26. SISTOTREMA. Persoon.

20 S. CONFLUENS. Pers. E.F. 1.

Genus 27. IRPEX. Fries.

21 I. PENDULUS. Fr. E.F. 1.
22 I. CRISPUS. Schœff.=HYD. CRISPUM. E.F.
23 I. LACTEUS. Fr. E.F. 2.
24 I. OBLIQUUS. Fr.=BOL. LACHRYMANS. Bolt. t. 167. f. 1.

Genus 28. RADULUM. Fries.

25 R. ORBICULARE. Fr. E.F. 1.
26 R. QUERCINUM. Fr. An. 362.

Genus 29. PHLEBIA. Fries.

27 P. MERISMOIDES. Fr. E.F. 2.
28 P. RADIATA. Fr. E.F. 3.
29 P. VAGA. Fr. An. 51.

Genus 30. GRANDINIA. Fries.

30 G. GRANULOSA. Pers. E.F. THEL. 35.
31 G. PAPILLOSA. Fr. An. 282.

Genus 31. ODONTIA. Fries.

32 O. BARBA JOVIS. Bull. E.F. HYD. 13.
33 O. FIMBRIATA. Pers. E.F. HYD. 14.

Genus 32. KNEIFFIA. Fries.

34 K. SETIGERA. Fr. An. 363.

FAM 4. *AURICULARINI.* Fries.

Genus 33. CRATERELLUS. Fries.

1 C. LUTESCENS. Pers. E.F. CANTH 4.

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2 C. CORNUCOPIOIDES. L. E.F. CANTH 6.
3 C. SINUOSUS. Fr. E.F. CANTH 7.

Genus 34. THELEPHORA. Ehrenberg.

Sub-genus 1. MESOPUS.

4 T. ELEGANS. Pers. Sow t. 412.
5 T. PANNOSA. Sow. E.F. 2.
6 T. UNDULATA. Fr. An. 75.
7 T. TUBEROSA. Grev. E.F. 5.
8 T. CARYOPHYLLÆA. Fr. An. 283.

Sub-genus 2. MERISMA.

9 T. PALMATA. Scop. E.F. 4.
DIGITATA. Sow. t. 156.
10 T. CORALLOIDES. Fr. E.F. 3.
11 T. TERRESTRIS. Ehr. E.F. 7.

Sub-genus 3. APUS.

12 T. CRISTATA. Pers. E.F. 6. An. 284.
13 T. FASTIDIOSA. Fr. An. 285.
14 T. MOLLISSIMA. Pers. An. 286.
15 T. LACINIATA. Pers. E.F. 8.
16 T. BIENNIS. Fr. An. 364.

Sub-genus 4. RESUPINATUS.

17 T. CÆSIA. Pers. An. 365.
18 T. BYSSOIDES. Pers. E.F. 19.
19 T. SEBACEA. Fr. = T. INCRUSTANS. Pers. E.F. 28.
20 T. PUTEANA. Schum. An. 7.
21 T. LAXA. Fr. An. 366.
22 T. ARIDA. Fr. An. 8.

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Genus 35. STEREUM. Fries.

Sub-genus 1. MESOPUS.

23 S. ELEGANS. Mey. E.F. THEL. 1.

Sub-genus 2. APUS.

24 S PURPUREUM. Pers. E.F. THEL. 13.
25 S. VORTICOSUM. Fr. Bolt. t. 82. f. D?
26 S. HIRSUTUM. Willd. E.F. THEL. 12.
27 S. SPADICEUM. Fr. An. 50.
28 S. SANGUINOLENTUM. Alb. and Sch. E.F. THEL. 14
29 S. HEPATICUM. Fr. Sow. t. 388. f. 2.
30 S. RUBIGINOSUM. Schrad. E.F. THEL. 9.
31 S. TABACINUM. Sow. An. 152. E.F. THEL. 10.
32 S. AVELLANUM. Fr. E.F. THEL. 18.
33 S. RUGOSUM. Pers. E.F. THEL. 11.
34 S. RUFUM. Fr. E.F. THEL. 17. syn.

Sub-genus 3. RESUPINATUS.

35 S. ACERINUM. Pers. E.F. THEL. 40.

Genus 36. AURICULARIA. Fries.

36 A. MESENTERICA. Fr. E.F. PHLE. 1.

Genus 37. CORTICIUM. Fries.

Sub-genus 1. APUS.

37 C. BOLTONII. Fr. Bolt. t. 166. fig. d.
38 C. AMORPHUM. Pers. E.F. THEL. 15.

Sub-genus 2. HIMANTIA.

39 C. GIGANTEUM. Fr. E.F. THEL. 27.

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40 †C. LACTESCENS. Berk. E.F. THEL. 26.
41 C. LACTEUM. Fr. An. 81.
42 C. LÆVE. Pers. An. 80.
43 C. ROSEUM. Pers. E.F. THEL. 21.
44 C. VELUTINUM. Dec. An. 288.
45 †C. MINIATUM. Berk. E.F. THEL. 22.
46 C. SANGUINEUM. Fr. = THEL. AURANTIACA. E.F. 23.
47 C. SULPHUREUM. Pers. E.F. THEL. 24.
48 C. CŒRULEUM. Schrad. E.F. THEL. 20.
49 †C. ARACHNOIDEUM. Berk. An. 287.

Sub-genus 3. LEJOSTROMA.

50 C. CALCEUM. Fr. E.F. THEL. 29.
51 C. LIVIDUM. Fr. E.F. THEL. 32.
52 C. OCHRACEUM. Fr. E.F. THEL. 31.
53 C. QUERCINUM. Pers. E.F. THEL. 16.
54 C. CINEREUM. Fr. E.F. THEL. 39. syn.
55 C. INCARNATUM. Pers. E.F. THEL. 37.
56 C. NUDUM. Fr. An. 715. E.F. THEL. 38.
57 C. CONFLUENS. Fr. An. 716.
58 C. CORRUGATUM. Fr. E.F. THEL. 41.
59 †C. LAURO-CERASI. Berk. E.F. THEL. 42.
60 C. COMEDENS. Nees. E.F. THEL. 36.
61 C. SAMBUCI. Pers. E.F. THEL. 30.

Genus 38. CYPHELLA. Fries.

62 †C. CUTICULOSA. Dicks. E.F. 1.
63 C. GRISEO-PALLIDA. Wein. An. 289.
64 C. MUSCIGENA. Pers. An. 717.
65 C. GALEATA. Schum. An. 718=CANTH. LÆVIS. E.F.
66 †C. OCHROLEUCA. Berk. An. 719.
67 C. GOLDBACHII. Wein. An. 720.

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Fam. 5. *CLAVARIEI.* Fries.

Genus 39. CLAVARIA. Vaill.

Sub-genus 1. RAMARIA.

LEUCOSPORÆ.

1 C. Botrytis. Pers. An. 721.
2 C. amethystina. Bull. E.F. 7.
3 C. fastigiata. L.=C. pratensis. E.F. 5.
4 C. muscoides. L.=C. corniculata. E.F. 6.
5 C. coralloides. L. E.F. 1.
6 C. cinerea. Bull, Grev. t. 64. E.F. 1 syn.
7 C. cristata. Holmsk. E.F. 8.
8 C. rugosa. Bull. E.F. 9.

OCHROSPORÆ.

9 C. aurea. Schœff. An. 722.
10 C. abietina. Pers. E.F. 4.
11 C. flaccida. Fr. An. 154.
12 C. crocea. Pers. An, 367.
13 C. grisea. Pers. E.F. 2.
14 C. condensata. Fr.=C. muscoides. Sow. t. 157.
15 C. stricta. Pers. E.F. 3.
16 C. crispula. Fr. An. 723.

Sub-genus 2. SYNCORYNE.

17 C. purpurea. Müll. An. 368.
18 C. rufa. Müll. An. 155.
19 C. rosea. Dalm. E.F. 12.
20 C. fusiformis. Fr. E.F. 13 and 14.
21 C. inæqualis. Fr. E.F. 15 and 16.
22 C. argillacea. Fr. An. 370.
23 C. vermicularis. Sw. E.F. 18.
24 † C. tenuipes. Berk. An. 369.
25 C. fragilis. Holmsk. E.F. 17.

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Sub-genus 3. HOLOCORYNE.

26 C. PISTILLARIS. L. E.F. 10. An. 82.
27 C. CONTORTA. Holmsk. An. 291.
28 C. ARDENIA. Sow. E.F. 11.
29 C. JUNCEA. Fr.
var. β. VIVIPARA. An. 52.
30 C. CANALICULATA. Fr. Bolt. t. 110. fig. albæ.
31 C. ACUTA. Sow. E.F. 20.
32 C. UNCIALIS. Grev. E.F. 19.

Genus 40. CALOCERA. Fries.

33 C. VISCOSA. Pers. E.F. 1.
34 C. TUBEROSA. Sow. E.F. 2.
35 C. CORNEA. Batsch. E.F. 3.
36 C. GLOSSOIDES. Fr. An. 371.

Genus 41. TYPHULA. Fries.

37 †T. GRACILIS. Desm. and Berk. An. 84.
38 T. GYRANS. Batsch. E.F. 1.
39 T. ERYTHROPUS. Pers. E.F. 3.
40 T. PHACORHIZA. Reichard. E.F. 2.
41 T. INCARNATA. Lasch.=PHACORHIZA FILIFORMIS. Grev. t. 93.
42 T. MUSCICOLA. Pers. E.F. PIST. 4.
43 T. GREVILLEI. Fr.=CLAVARIA TRICHOPUS. Grev. t. 49.
44 T. FILIFORMIS. Bull. E.F. 5.
45 T. TENUIS. Sow. E.F. 4.

Genus 42. PISTILLARIA. Fries.

46 P. MICANS. Pers. E.F. 1.
47 †P. PUBERULA. Berk. E.F. 2.
48 P. FULGIDA. Fr.=CLAVARIA MINUTA. Sow. 391.
49 P. CULMIGENA. Fr. An. 85.
50 P. QUISQUILIARIS. Fr. E.F. 3.

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51 P. OVATA. Fr.=CLAVARIA POLYMORPHA. Sow. t. 276.
52 P. PUSILLA. Pers. E.F. 5.

FAM. 6. *TREMELLINÆ.* Fries.

Genus 43. TREMELLA. Persoon.

1 †T. VESICARIA. Bull. An. 724.
2 †T. VERSICOLOR. Berk. An. 726.
3 †T. VISCOSA. Pers. E.F. THEL. 33.
4 †T. TORTA. Willd. An. 372.
5 †T. EPIGÆA. Berk. An. 373.

MESENTERIFORMES.

6 T FIMBRIATA. Pers. E.F. 1
7 T. FOLIACEA. Pers. An. 13.

CEREBRINÆ.

8 †T. FERRUGINEA. Smith. E.F. 3.
9 T. ALBIDA. Smith. E.F. 6.
10 T. INTUMESCENS. Smith. E.F. 7.
11 T. INDECORATA. Som. An. 725.

CORYNE.

12 T. SARCOIDES. With. E.F. 8.
13 T. CLAVATA. Pers. E.F. 9.

Genus 44. EXIDIA. Fries.

14 E. AURICULA JUDÆ. L. E.F. 1.
15 E. RECISA. Ditm. E.F. 2.
16 E. GLANDULOSA. Bull. E.F. 3

Genus 45. NÆMATELIA. Fries.

17 †N. VIRESCENS. Corda. An. 374.
18 N. ENCEPHALA. Fr. An. 292.
19 N. RUBIFORMIS.* Fr. H.H.H.
20 N. NUCLEATA. Fr. E.F. 1? cfr. An. 292.

* Identified by the Rev. A. Bloxam.

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Genus 46. DACRYMYCES. Nees.

21 †D. DELIQUESCENS. Bull. An. 728.
22 D. MORIFORMIS. Smith. E.F. 1.
23 D. VIOLACEUS. Relh. E.F. 2.
24 D. STILLATUS. Nees. E.F. 3.

ADDENDA.

†AGARICUS AROMATICUS. Sow. E.F. 26.
† ,, PACHYPHYLLUS. Berk. E.F. 31.
† ,, UNDATUS. Berk. E.F. 127.
† ,, RUBIDUS. Berk. An. 3.
† ,, CYPHELLIFORMIS. Berk. An. 49.
† ,, TRECHISPORUS. Berk. An. 71.

CORRIGENDA.

Page 17, note. *For* Corticeum, *read* Corticium.
,, 19, line 1. *For* TYPHULIA, *read* TYPHULA.
,, ,, ,, 7. *After* invested, *insert*, by the
,, ,, last line. *For* concatinate, *read* concatenate.
,, 24, line 12. *For* DRYOPHYLLUS, *read* DRYOPHILUS.
,, 25, line 10. *For* SANQUINOLENTUS, *read* SANGUINOLENIUS.

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THE FUNGI OF LIVERPOOL

AND ITS VICINITY.

PART I.

HYMENOMYCETES:

ARRANGED ACCORDING TO THE EPICRISIS OF M. FRIES.

BY THE

REV. HENRY H. HIGGINS, M.A.CANTAB., V.P.

READ BEFORE THE SOCIETY ON 10TH APRIL, 1858.

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In the preparation of the following list of Fungi, nearly all the British, and many of the foreign authorities have been consulted. For the means of doing this I am principally indebted to Joseph Dickinson, Esq. M.D. F.R.S., who has kindly allowed me to retain in my possession for three years, many rare and valuable works from his extensive library. Amongst these I may mention Sowerby's "British Fungi," 3 vols. folio, Bolton's "History of Funguses, growing about Halifax," 4to., Batsch's "Elenchus Fungorum," 4to., Greville's "Scottish Cryptogamic Flora," 6 vols. 8vo., Sturm's "Deutschlands Flora," 34 parts, &c.

The library at the Athenæum has enabled me to refer to Schœffer's work; and my thanks are due to the Committee of the Liverpool Free Public Library for purchasing at my suggestion the very valuable work by Bulliard, "Hist. des Champign. de la France," 5 vols. 4to. The names of several friends who have assisted me with specimens, &c., will appear in the list.

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PREFACE.

The arrangement adopted in the following paper is taken from the "Epicrisis Systematis Mycologici," of Elias Fries, published at Upsal in 1838, and from the "Anleitung zum Studium der Mycologie," of A. C. J. Corda, published in 1842.

The descriptions of species have been chiefly taken from notes made at the time when the plant was collected. The terms employed in the English Flora have however been used when considered to apply better than any others to the specimens in hand.

The principal parts of an Agaric are, first the *pileus*, the horizontal portion of the plant, which is generally elevated on a stem. The form of its upper surface varies from sub cylindrical or conical to umbilicate or infundibuliform. When its convexity becomes more acute towards the centre it is said to be *umbonate*. The under surface of the pileus is furnished with vertical plates or *gills* radiating from the stem. When the gills are attached to the stem by their whole breadth they are said to be *adnate*, if in contact only with the stem, they are *adnexed*; if not in contact, they are *free*; if continued down the stem they are *decurrent*. Sometimes they are sinuated, or emarginate, or rounded off behind, that is next the stem.

When the plant is young the margin of the pileus is attached to the stem by a membrane or web, *veil*, which is ruptured as the pileus expands and may be left on the stem forming a collar or *ring*. In many species the veil is absent or so delicate as to be imperceptible. The pileus and stem when young are sometimes enveloped in a

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membrane, *volva*, which is ruptured by the growth of the plant; the upper portion remaining on the pileus forming patches, warts or scales, the lower portion loosely surrounding the base of the stem. In many species the volva is imperceptible.

The gills are variable in size and shape; when all are of equal length they are *simple*, when shorter ones are interposed they are *unequal*. Each gill has commonly a central portion, *trama*. The surface on both sides of the gills is formed by the spore-bearing membrane, *hymenium*. The ordinary floccose trama is sometimes replaced by a layer of globular cells intermixed with vessels containing a milky fluid.

The hymenium is made up of parallel cells, the extremities of which form the surface. They are of three kinds; barren thread-like cells, *paraphyses;* other cells, *basidia*, which are somewhat larger and are attenuated towards the outer extremity which is sometimes slightly knobbed and bears from one to six, ordinarily four, minute points, *sterigmata*. Each sterigma supports a seed or *spore*. Sometimes may be found a third kind of cells, *antheridia*, simple, very delicate and filled with fluid containing minute particles which have a rapid swarming motion. These cells disappear before the basidia are developed.

The spores are variously shaped, globular, elliptical, straight or curved, obliquely truncate at one extremity, *legumeniform*, generally smooth but sometimes rough or echinulate. From the spore under circumstances favourable for germination is produced a a simple or branched filament which alone is incapable of fructification, but when the filaments of many spores unite, or when the filament of a single spore has become sufficiently compound, a soft white web, *mycelium*, is formed, from which springs the reproductive organ ordinarily regarded as the whole of the plant.

The measurements of spores in the accompanying list have in each instance been made with the assistance of a stage micrometer. If the spores in any particular species vary in size those of the largest kind have been taken as the standard. The longest diameter only has been given. The term elliptic I have used to denote an oval in which the longitudinal and transverse diameters are in

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the proportion of three to two. The same proportion exists in oblong and fusiform spores, but in the former the sides are parallel, in the latter the ends are pointed.

	Species known in 1838.	British Species.
Agaricini	1600	494
Polyporei	409	123
Hydnei	143	34
Auriculariini	200	67
Clavariei	103	52
Tremellini	43	24
HYMENOMYCETES	2498	794

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The numbers following the names denote in inches, unless otherwise expressed,

1st. The height of the plant.

2nd. The breadth of the pileus.

3rd. The diameter of the stem.

E.F. The English Flora, vol. v., by the Rev. M. J. Berkeley.

S.M. Systema Mycologicum. Fries.

An. Annals and Magazine of Natural History.

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HYMENOMYCETES.

Fam. I. *AGARICINI.* Fries.

Genus 1. AGARICUS.

Series I. **Leucospori.**

Sub-genus AMANITA.

§ a. *Ring conspicuous.*

1 A. muscarius. L. 4—7. 3—5. ½—¾.

Pileus vermilion or orange red, dotted with white conical warts, margin striate; ring not striate. The most beautiful of all the British Agarics. "Highly narcotic, producing in small doses intoxication and delirium, for which purpose it is used in Kamschatka, and in larger, death." Wood near Woolton, Oct., 1856. Knowsley Park, near the Longborough Lodge, Oct., 1857.

2 A. pantherinus. Dec. 6. 4. ½.

More slender and less highly coloured than the preceding species; warts flat; volva loose. Three or four specimens occurred under beech trees, Rainhill; the warts had nearly disappeared, and the pileus had a flea-bitten appearance, yellowish and red, which may have suggested the name.

3 A. Mappa. Willd. 3—4. 2—2½. ½.

Pileus convex, at first warty, margin smooth, pure white or lemon-coloured. Bold wood; abundant in Eastham wood. In both these localities the plant has its volva forming "a mere rim fringing the bulb." *A. phalloides. E.F. syn.*

4 A. rubescens. Pers. 3—5. 3—5. ¾—1½.

Pileus reddish grey; warts unequal; ring striate. The flesh when broken changes after a while to a reddish hue. Stem scaly. Whole plant stout and fleshy. Spores broadly elliptic, or oblong, ·0005. Woods and under trees; generally distributed.

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§ b. *Ring inconspicuous.*

5 A. VAGINATUS. Bull. 5—8. 3½—5. ½—1.

Pileus when young covered with large patches of the volva, which soon disappear, mouse-grey or fawn with the lustre of satin, margin beautifully furrowed. Spores round, nucleus large. ·00045. In woods; generally distributed but not abundant.

Sub-genus LEPIOTA.

6 A. PROCERUS. Scop. 5—9. 3—6. ½.

Pileus fleshy, obtusely conic, then nearly plain; epidermis greyish brown, breaking up into large shaggy scales; gills free; stem strong, bulbous, with an ample, moveable ring. Spores elliptic. ·0009. Grassy places and sides of lanes. Knowsley. Rainhill. Bidston. Childwall.

7 A. EXCORIATUS. Schœff. 2—3. 1½—3. ½.

Evidently allied to *A. procerus*, but smaller, the pileus less umbonate; epidermis cracked into little patches but not squarrose; ring more delicate and not so loose on the sub-bulbous stem. Spores elliptic. ·0008. Pastures. New Brighton.

8 A. CLYPEOLARIUS. Bull. 2—2½. 1—1½. 2 lines.

Pileus campanulate, strongly umbonate; epidermis rather white and shining; squarrose scales arranged concentrically; umbo obtuse, yellowish olive, appearing as if denuded; stem minutely scaly; odour none. Spores legumeniform. ·00033. In a grassy hollow, New Brighton.

9 A. CRISTATUS. Bolt. 1½—2½. 1—1½. 1 line.

Pileus thin and crisp, conical, or expanded and sharply umbonate, scaly, white, apex brown. Odour acrid, like that of hot oil. Under walls and hedges. Rainhill and Croxteth.

10 A. GRANULOSUS. Batsch.

The typical form of A. granulosus does not appear to be found in this neighbourhood, at least I have seen no plant agreeing with the fig. given by Batsch.

var. AMIANTHINUS. Fr. 2—3. ¾. ⅛.

Pileus obtusely umbonate, farinaceous, orange tawny; stem pale, scaly below the ring which is of the same colour as the pileus. Spores elliptic. ·00025. Fir woods amongst moss. Knowsley and Stourton.

α. 3. ½—¾. ⅛.

Pileus pale, sub-viscid when moist, not powdery, strongly wrinkled. Pastures, under trees. Knowsley.

β. 2. ¾—1¼. ⅛.

Pileus convex, smooth, nearly white, margin fringed. Open pastures. Knowsley.

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Sub-genus ARMILLARIA.

11 A. MELLEUS. Vahl. 2—8. 2—7. ½—1.

Pileus yellowish ferruginous, rough with scales formed of black hairs; gills pale, becoming rusty red, decurrent, "forming streaks on the stem down to the ring, which is large." (Greville.) Densely tufted. Spores unequal, broadly elliptic. ·00028. Oct. Nov. One of the most common of the Agarics, growing everywhere on stumps and at the roots of trees. It occurred in a plantation at Eccleston, in 1856, in such profusion as almost to hide the ground with tufts containing from ten to fifty plants. The surrounding vegetation became hoary with the white spores.

Sub-genus TRICHOLOMA.

Limacina—pileus viscid when moist.

13 A. ALBO-BRUNNEUS. Pers. 3. 3—4. ½—¾.

Pileus when young dome-shaped, then nearly flat, covered with a glutinous slime, at first pale, then chestnut brown; gills cream coloured, with a descending angle. Spores nearly round. ·00022. "Allied to the plants of the preceding sub-genus." (Fries). Plantation, Rainhill, Oct. 1857. Loosely tufted.

12 A. FLAVO-BRUNNEUS. Fries. 3—4. 3—8. ½—1.

Pileus slimy when moist, tawny, with fibrillous scales of a red cedar colour; gills tawny yellow. *A. fulvus. E.F.* Spores broadly elliptic. ·00028. Railway bank, Spittal. Lane, near Eastham. Wood, Woolton.

Genuina—pileus dry, floccose or fibrillose.

14 A. RUTILANS. Schœff. 2—3. 2—4. ½—¾.

Pileus sub-hemispherical, surface like the ripe side of a peach; the down at length becomes more scattered, shewing the yellow flesh; gills deep golden yellow. Very beautiful when in fine condition. On fir stumps. Knowsley and Stourton.

15 A. COLUMBETTA. Fries. 2. 2—4. ½—¾.

Pileus convex or wavy, centre dilute mouse-colour, shaded off to the involute margin, which when young is white and tomentose; gills close; stem uneven. Gregarious. Open pastures. Halsnead and Knowsley.

16 A. VACCINUS. Schœff. 3. 2—2½. ½.

Pileus covered with a thick nap, sordid pale reddish brown, the nap in the centre forming broad scales, that on the margin minute tufts; gills with rusty stains; stem hollow. Spores broadly elliptic. ·00025. Woods. Knowsley, Acorn field.

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17 A. MULTIFORMIS. Schœff. 1—3. 1—4. ¼—¾.

Pileus bluntly conic, or expanded, often cracked, or irregular, nap mouse-grey, or slate coloured; stem white, silky. Spores nearly round. ·0002. Under trees, or in woodland pastures. Common. Gregarious.

Spongiosa—pileus compact, bare.

18 A. PERSONATUS. Fries. 1—3. 2—5. ½—¾.

Pileus convex, smooth, purple or brownish lilac; gills violet; stem tinged with violet. When in fine condition this is a very beautiful plant, every part is neat and compact, and the gills are of a lovely amethystine hue. Gregarious. Esculent. Spores elliptic, yellowish. ·00033. Sides of lanes, and pastures; generally distributed.

19 A. NUDUS. Bull. 2. 2—3. ½—¾.

Pileus thin, depressed or wavy. Much resembling the preceding species, but inclined to be watery, and to assume a reddish hue. Spores narrowly elliptic. ·00033. Woodland pastures; generally distributed.

Hygrophana—pileus more or less umbonate, hygrophanous.

20 A. GRAMMOPODIUS. Bull. 2—3. 3—5. ½—¾.

Pileus compact, convex, then expanded, quite smooth, pale dusky, margin at length raised and wavy; gills dusky-white, slightly decurrent. Gregarious. The description of *A. nebularis* in the E.F. belongs to this plant. Rev. M. T. Berkeley, in the Annals, No. 61. Excellent for food. Spores elliptical. ·0004. Warren, New Brighton. Southport, Rev. T. P. Kirkman.

Sub-genus CLITOCYBE.

SECT. A. Pileus fleshy, colour unchanged in drying.

Disciformes—pileus convex, then plane or depressed.

21 A. NEBULARIS. Batsch. 3—4. 2—4. 1—1½.

Pileus convex, very smooth, colour of lead, margin rounded; stem ventricose, hollow, elastic, streaked; gills close, pale yellowish. Spores irregular, narrow. ·00028. Gregarious, in an old saw-pit, Bromborough. This plant which is A. canaliculatus, E.F., and A. turgidus, Greville, is represented by Batsch with a sub-cylindrical stem.

22 A. CERUSSATUS. Fries. 2. 2—3. ½.

Pileus nearly plane, opaque white, often shining as if enamelled; gills not decurrent. Grassy places, Crosby and New Brighton.

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23 A. DEALBATUS. Sow. 1. 1—2. ¼.

Pileus rather thin, opaque white, often depressed, excentric or lobed, margin narrowly involute; gills sometimes pale flesh colour. Common amongst grass under trees, and in woods.

Infundibuliformes—infundibuliform, or deeply umbilicated.

24 A. GIGANTEUS. Sow. 3—4. 4—10. 1—1½.

Pileus infundibuliform, not umbonate; whole plant cream white; gregarious. Spores nearly round. ·00028. Pasture, Bold Park, three years successively in the same spot. Plantation, Rock Ferry.

25 A. GEOTRUPUS. Bull. 5—6. 3—4. ½—1½.

Pileus infundibuliform, umbonate, cream-coloured; stem stuffed straight, somewhat attenuated upwards. *A. infundibuliformis var. β major. E.F.* Spores round. ·0003. Wood, Ince Blundell, Nov., 1857.

26 A. FLACCIDUS. Sow. 1—2. 2—3½. ⅛—¼.

Pileus at length infundibuliform, thin, margin deflexed, beautiful reddish buff, sometimes paler; stem stuffed, soon hollow. Tufted. Spores nearly round. ·00018. Eastham, Nov., 1856. Warren, New Brighton, abundant, Nov., 1857.

SECT. B. Pileus carnoso-membranaceous, truly hygrophanous.

Cyathiformes—gills descending.

27 A. CYATHIFORMIS. Bull. 1. ½—1. 1 line.

Pileus depressed, margin narrowly deflexed, liver-coloured, shining, paler when dry; gills narrow, paler than the pileus; stem unequal. Spores broadly elliptic. ·00038. On a fallen tree, Knowsley, Nov., 1857.

Orbiformes—gills not truly decurrent.

28 A. METACHROUS. Fries. 2—3. 1—2. 2 lines.

Pileus sub-carnose, neat, smooth, margin plane, centre depressed, colour of putty when moist, white when dry; gills at length descending; inodorous, gregarious. Spores elliptic. ·00027. Very common in woods, November.

Versiformes—gills adnate, sub-distant.

29 A. LACCATUS, Scop. 2—6. 1—2½. ¼.

Pileus convex or depressed, varying from flesh-colour to a fine brown-red, often beautifully squamulose; gills distant, of the same colour as the pileus; stem tough, crooked. Spores rough, round. ·00035. Woods. Very common.

var. AMETHYSTINUS. Sow.

Extremely beautiful in colour, amethyst, or purple. Woods, Eastham and Croxteth.

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Sub-genus COLLYBIA.

Striæpedes—stem sulcate or fibroso-striate.

30 A. RADICATUS. Relh. 4—6. 2—3. ¼.

Pileus nearly plane, wrinkled, viscid, dusky or light brown; stem attenuated upwards; root long, tapering. Spores broadly elliptic. ·0006. About the roots of trees. Halsnead, Patrick Wood, &c.

31 A. MACULATUS. Alb. & Schw. 3—4. 3—5. ¼—⅜.

Pileus nearly plane, white, spotted with rusty red; gills narrow; gregarious. Spores sub-globose. ·00025. Fir plantations. Bold, Eastham, Rainford, &c.

32 A. BUTYRACEUS. Bull. 2—3. 2—3. ¼.

Pileus obtusely convex, slightly umbonate, smooth, centre dark livid brown, towards the margin much paler, substance watery, tough; stem at length hollow, expanded below and sub-bulbous, downy at the base. Spores sub-lanceolate. ·0003. Under beech trees. Knowsley, &c., end of Oct. and Nov.

Vestipedes—stem velvety, floccose or pruinose.

33 A. VELUTIPES. Curt. 2—8. 1—2. ¼—½.

Pileus bright tawny yellow; gills pearly yellow; stem often curved, the lower part velvety, of a fine rich brown. Tufted. Spores elliptic. ·00033. Common on stumps and rotten wood. A truly winter Agaric, enduring the sharpest frosts.

34 A. CONFLUENS. Pers. 3. 1½. 2 lines.

Pileus irregular, brown, paler when dry; gills remote; stem twisted, villous; densely tufted; stems confluent at the base. Eastham Wood, Aug., 1856.

35 A. TUBEROSUS. Bull. 1. ¼—½. ½ line.

Pileus nearly plane, minutely umbonate, white, umbo pale, rufescent. Doubtfully referred to this species. Growing (without bulbs) under *Polyporus giganteus*, Knowsley. Sometimes growing on a *Sclerotium*; sometimes forming a bulb resembling a *Sclerotium*. See a full account, given in No. 44 of the series, in the Annals.

Lævipedes—stem fistulose, smooth.

36 A. XANTHOPUS. Fries. 2½. ½. 1 line.

Pileus convex, sub-carnose, dry, yellowish-white; gills broad, free; basidia prominent; stem equal, minutely fistulose, very firm and tough, white at the apex, tawny below, strigose at the base; root long, fibrous. Spores small, legumeniform. Fir plantation, Rock Ferry, May, 1858.

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37 A. DRYOPHILUS. Bull. 1—3. 1—2. ¼.

Pileus thin, nearly plane, hygrophanous; pileus and gills pale or pinkish; whole plant rather tender. Moist places amongst leaves. Not uncommon.

38 A. CLAVUS. Bull. 1. ⅛. Very slender.

Pileus campanulate, orange-red. Spores narrow, apiculate at one end. ·00033. On a rotten stick, Bromborough Wood, Oct., 1857.

Sub-genus MYCÆNA.

Calodontes—gills with the margin of a different colour.

39 A. ELEGANS. Pers. 2. ½. ½ line.

Pileus very tender, apex livid, margin striate, lemon-coloured; gills with the margin yellow. On sticks. Prescot Cars, Oct. 1856.

Adonideæ—somewhat brightly and permanently coloured.

40 A. PURUS. Pers. 3—4. 1. 1 line.

Pileus subcarnose, convex, sub-diaphanous, amethystine odour like that of radishes. Spores oblong. ·0003. Croxteth, Ince Blundell. The Warren, New Brighton.

41 A. LACTEUS. Pers 2½. ½. ½ line.

Pileus sub-umbonate, milky white, finely striate. On a hedge bank. Rainhill.

Rigidipedes—gills changing colour; stem firm, rooting.

42 A. GALERICULATUS. Scop. 1—6. ½—2½. ⅛—¼.

Pileus campanulate or quite expanded or umbonate, brownish grey, substriate; gills rather distant, in large specimens connected by veins, whitish or pinkish; stem downy at the base. Spores varying in size, subglobose. ·0004. "*Maxime variabilis*," Fries. A plant so variable as almost to discourage the study of the species in affinity with it. Solitary or densely tufted. Very common on the ground or on stumps or fallen trees.

Fragilipedes—stem scarcely rooting, not dilated; pileus hygrophanous.

43 A. ALCALINUS. Fries.

The only plant hitherto found in this neighbourhood agreeing with the description and possessing the peculiar nitrous odour of *A. alcalinus*, is a small, campanulate, dark grey, striated Mycæna, not uncommon in grassy places. It may probably be *A. ammoniacus*, Fries.

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Lactipedes—stem yielding an opaque juice.

44 A. SANGUINOLENTUS. Alb. & Schw. 1—3. 1—2 lines. ⅛ line.

Pileus delicate, tinged with a vinous colour. The stem when broken near the base yields a juice of the colour of port wine. Spores varying in size, legumeniform. ·0004. Common in woods.

45 A. GALOPUS. Pers. 2—3. ½—¾. 1 line.

Pileus campanulate, semi-oval or semi-fusiform, roughly and somewhat distantly striate, bluish black, opaque, sub-pruinose; gills distant, glaucous; stem tough, dark grey. Common in woods, on stumps and amongst grass.

46 A. CHELIDONIUS. Fries. 1—4. ¼—⅜. ½ line.

Pileus campanulate or obtusely conical, very tender; diaphanous, hence appearing finely striate; apex light brown, margin paler; gills whitish, not distant. On leaves, especially under *Pteris aquilina*. The stem of this and the preceding species when broken yields a drop of whitish milky juice.

Glutinipedes—stem viscid.

47 A. EPIPTERYGIUS. Scop. 3—4. ½—1. ¾ line.

Pileus and stem viscid. Pileus very thin, covered with an epidermis which easily peels off when moist, margin dentate; stem yellow, especially at the apex. Spores irregular, narrower at one end, ·00035. Very common in heathy woods.

48 A. VULGARIS. Fries. 1—1½. ¼—½. ¾ line.

Pileus and stem viscid. Pileus plane, dusky, striate; gills decurrent, white; stem tough. Identified by the Rev. A. Bloxam. Growing in myriads on fir leaves in a wood at Croxteth.

Basipedes—stem adhering by a disc.

49 A. STYLOBATES. Pers. 1—1½. 1—2 lines. ⅛ line.

Pileus bluntly campanulate, striate, slightly hairy, white. Whole plant very delicate. On decayed wood in a very moist place. Rainhill. Dec., 1857.

Insititiæ—base of stem without a proper root, growing in a vegetable matrix by flocci or a tubercle.

50 A. HIEMALIS. Retz. ½—1. 1—3 lines. ¾ line.

Pileus hemispherical, striate, brown; stem curved. *A. corticola*. E.F. On bark, Croxteth.

Sub-genus OMPHALIA.

Collybiariæ—pileus expanded, margin inflexed.

51 A. PYXIDATUS. Bull. 1—2. ½. ¾ line.

Pileus infundibuliform, reddish; gills narrow, distant, decurrent. Grassy places on the coast.

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52 A. MURALIS. Swartz. ½—1. ½—1. 1 line.

Pileus reddish brown, striate, umbilicate; stem curved; gills broad, distant, decurrent. Spores elliptic. ·00033. On walls amongst moss. Bold. Halsnead. Woolton.

53 A. UMBELLIFERUS. L. ½—1. ½—1. 1.

Pileus sub-membranaceous, centre depressed, margin deflexed, striate, pale yellow-brown; gills distant, broad behind. Moist heathy ground. Knowsley. Stourton.

Sub-genus PLEUROTUS.

Excentrici—pileus entire.

54 A. DRYINUS. Pers. 2. 3. ¾.

Pileus hard, excentric, almost lateral, dirty white with brown scales. A specimen was in the possession of Mr. F. P. Marrat, said to be gathered by Mr. Fisher from a tree on St. James's Mount, Liverpool.

55 A. ULMARIUS. Bull. 3—4. 4—6. 1.

Pileus fleshy, dry, dirty white, flesh white; gills broad, unequal, white, yellowish when dry; stem curved, ascending. In the hollow of an ash. Croxteth. On ash, Liscard; I. Byerley, Esq. On ash, Runcorn.

56 A. OSTREATUS. Jacq.

Pileus excentric or dimidiate, fleshy, clammy, smooth when dry, deep lead colour, from three to fourteen inches in breadth, margin involute when young; gills white, forked; stem when present stout, firm, downy. Spores oblong, narrow. ·0004. Timber yard, Bold, Nov. 1856. Nearly covering a fallen tree, Knowsley, Nov. 1857.

57 A. SALIGNUS. Pers.

Pileus dimidiate, four inches broad, rather thin, firm, grey or pale dun, depressed and downy at the base, margin never involute. Spores oblong, three times longer than broad. ·0005. On a willow in a garden at Poolton; I. Byerley, Esq.

Resupinati—pileus resupinate, at length sub-reflexed.

58 A. APPLICATUS. Batsch.

Pileus sub-sessile, dimidiate, half-an-inch broad, dark grey, villous at the centre; gills grey. On rotten wood, Eastham. Rainhill.

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Series II. **Hyporhodii.**

Sub-genus VOLVARIA.

59 A. BOMBYCINUS. Schœff. 3—6. 4—6. ¾.

Pileus fleshy, when young very obtusely campanulate, then expanded and plane, beautifully silky, not viscid, crumb of bread colour; gills ventricose, free, white, then pink, at length brownish; stem firm, attenuated upwards; volva forming a flaccid cup at the bottom of the stem. Growing gregariously on a heap of compost by the road side near Eccleston, June, 1856. The dimensions correspond with those given by Fries in S.M., but *A. bombycinus* is said to grow upon trees. Schœffer's plate of *A. bombycinus* does not indicate the peculiarly beautiful cylindrico-campanulate form of the Eccleston plant when young.

60 A. SPECIOSUS. Fries. 5. 4. ½ above, ¾ below.

Pileus obtusely conic, becoming expanded and broadly umbonate, very viscid, greyish white, centre yellowish from the thickened slime; gills broad, ventricose, free, pale, then rose colour, brownish inclining to cinnamon when dry; stem smooth, straight, firm, slightly attenuated upwards; subbulbous; volva not distinctly lobed. Spores elliptic, clouded with pinkish olive. ·00063. Basidia almost immersed, apices hemispherical. Solitary, amongst grass watered by a drain, New Brighton.

Sub-genus PLUTEUS.

61 A. CERVINUS. Fries. Ep. 3—5. 2—4. ½—¾.

Pileus fleshy, at first oval, then broadly convex, often silky, when young nearly black, then umber or smoky brown; gills ventricose, free, remote when dry, pale, changing to rose. Spores broadly elliptic. ·0004. Basidia conspicuous. A. *Pluteus*. E.F. About saw-pits, and rotten stumps; common throughout the year.

Sub-genus ENTOLOMA.

62 A. SERICELLUS. Fries. 2. ¾. 1 line.

Pileus thin, pale, silky but not very smooth; gills delicate rose-colour; stem white. In woodlands, amongst grass. Knowsley. Stourton.

63 A. RHODOPOLIUS. Fries. 2—4. 1—3. ⅛—¼.

Pileus rather fleshy, nearly plane, satiny, very dark brown, paler when dry; gills broad, grey, changing to rose; stem firm, often dusted at the apex with rose-coloured spores; odour nitric. Spores many angled, nucleus round. ·0004. Pastures. Flaybrick, Rainhill, &c.

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64 A. CLYPEATUS. Fries Ep. *var.* MAMMOSUS. Bolt. 3—4. 1—3. ¼.

Pileus fleshy, strongly umbonate, mouse grey, sometimes with a shade of rose; odour mealy. Spores many angled, nucleus round. ·0005. Pastures. Rainhill, Knowsley, &c.

65 A. COSTATUS. Fr. Ep.

Pileus thin, somewhat oval or expanded, hygrophanous, dark livid brown; stem hollow, pale, squamulose at the apex; gills slightly adnexed, pale, then rose-coloured; odour none; whole plant very fragile. Common in pastures. Rainhill, &c.

Sub-genus LEPTONIA.

66 A. CHALYBEUS. Pers. 1—1½. ¼—¼. 1 line.

Pileus dark blue, scaly; stem firm, steel-blue, base downy. A small group occurred in a pasture, Rainhill, October, 1857.

Sub-genus NOLANEA.

67 A. PASCUUS. Pers. 1—3. ¾—1½. 1—2 lines.

Pileus campanulate, then expanded, brown and striate when moist, pale when dry; gills dirty flesh-colour; stem slender, fistulose. Spores irregularly globose. ·00045. A variable plant, of which, according to Fries, ten distinct varieties may be recognized. Odour always like that of fresh meal. Pastures; very common.

SERIES III. **Dermini.**

Sub-genus PHOLIOTA.

Humigenei—growing on the ground.

68 A. AUREUS. Mathusk. 4—6. 4—6. ¾—1.

Pileus fleshy, convex, golden tawny with redder adpressed scales or streaks; gills nearly of the same colour; veil forming a ring near the apex of the stem. A conspicuously gay looking species, growing not unfrequently in large tufts on stumps in woods.

69 A. PRÆCOX. Pers. 1—2. 1—2. ¼.

Pileus fleshy, convex, then nearly plane, pale buff; gills pale purplish brown, subdecurrent with a tooth. Pastures and sides of lanes. Spittal. Rainhill.

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70 A. SPHALEROMORPHUS. Fr. Ep. 1—5. 1—1½. 1 line.

Pileus thin, convex, then plane or depressed, hygrophanous, yellowish olive; gills clouded, pale purple brown. In dry situations amongst moss it has a ring moderately persistent. It is, however, remarkable for its aquatic habits, often growing upon floating *Sphagnum* or *Hypnum cuspidatum*. var. A. *præcox*. E.F. Abundant in the pools on Sutton Moss.

Truncigenei—growing on wood.

71 A. PUDICUS. Fries. Ep. 1—3. 2—3. $\frac{1}{6}$—$\frac{1}{4}$.

Pileus white, with a tinge of yellow; stem curved; ring reflexed; whole plant remarkably firm and dry; tufted. *A. caperatus*. E.F. On an elder stump near the village of Morton, Cheshire.

72 A. SQUARROSUS. Müll. 2—4. 3—4. ½—1.

Saffron coloured, rough with large brownish scales, except on the stem above the ring; tufted; very handsome. On stumps. Rainhill. Runcorn.

73 A. ADIPOSUS. Batsch.

Croft. The Rev. Thos. P. Kirkman.

74 A MUTABILIS. Schœff. 2—4. 2—3. ½.

Pileus smooth, centre brownish orange, margin yellow, often watery; gills cinnamon; stem scaly below; tufted. Spores elliptical, annulus dark. ·00033. On stumps. Huyton Quarry, Knowsley, &c.

Muscigenei—growing on moss, or on the roots of grass.

75 A. MESODACTYLIUS. Berkeley. 2½. 1. 1 line.

Pileus obtusely conic, hygrophanous, apex umber, margin expanded, striate, pale; stem flexuous; ring central, deeply striate within; solitary. No. 329 of the series in the Annals. A few specimens have occurred amongst grass in my own garden, Rainhill.

Sub-genus HEBELOMA.

Inocybe—pileus fibrous or fibrilloso-squamose, dry.

76 A. LANUGINOSUS. Bull. 1—2. 1. 1—2 lines.

Pileus subcarnose, hemispherical, downy, greyish brown; gills pale; stem pruinose at the apex. Woods. Knowsley, Croxteth, &c.

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77 A. MARITIMUS. Fr. Ep. 1—2½. 1—2. ⅛—¼.

Pileus convex, then nearly plane, hygrophanous; margin often deflexed; gills adnate, at length dark cinnamon; stem solid, fibrillose. The colour of the plant varies from umber to light bay; when quite dry it is often covered with a whitish bloom. Very common at Crosby, Formby, and along the coast.

78 A. RIMOSUS. Bull. 1—2½. 1—2. ⅛.

Pileus campanulate, then expanded, umbonate, dusky brown, cracked radiately, sometimes also concentrically; stem fibrous, mealy. Common in pastures, under trees. A yellowish variety, nearly entire, occurs at Croxteth.

79 A. GEOPHYLLUS. Sow. 1—2. ½—¾. 1—2 lines.

Pileus bluntly conic, then expanded, with a prominent umbo, often rimose, satiny, white, lilac, or pale brown; gills greyish brown. Woods and gardens in many places.

Hymenocybe—pileus smooth, sub-viscid; gills inclining to watery cinnamon.

80 A. FASTIBILIS. Pers. 1—4. 1—3½. ⅛—½.

Pileus convex, at length nearly plane, fleshy, pale ochraceous; stem firm, sub-bulbous, with fibrous scales; veil forming a moderately persistent ring; odour disagreeable. On banks and in woods; not very common.

81 A. CRUSTULINIFORMIS. Bull. 1—2. 1—2. ⅛—¼.

Differs from *A. fastibilis* in its closer gills and in the veil, which is perceptible only in very young specimens. Common in sandy hollows from Waterloo to Crosby.

Sub-genus NAUCORIA.

82 A. MELINOIDES. Bull. 1—2. ½—1. 1 line.

Pileus sub-carnose, hemispherical, or with a broad umbo, smooth, hygrophanous, tawny bay when moist, ochraceous when dry; gills adnate, ventricose; stem hollow. Pastures. Knowsley, &c.

83 A. FURFURACEUS. Pers. 1—2. ½—1. 1 line.

Pileus convex, then quite expanded, hygrophanous, margin shewing the gills beneath, cinnamon, when dry pale buff, sometimes minutely scaly. Spores elliptic. ·0004. Common on sticks and chips throughout the year.

Sub-genus GALERA.

84 A. TENER. Schœff. 3—5. 1 high and broad. 1 line.

Pileus submembranaceous, semioval, hygrophanous, cinnamon, pale when dry; gills cinnamon; stem ferruginous, with a whitish gloss. Spores elliptic, highly coloured, with a hilum at each end. ·00066. Whole plant fragile. On dungy ground, by way sides in many places.

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85 A. HYPNORUM. Batsch. 1. 2—4 lines. ¼ line.

Pileus membranaceous, striate, hygrophanous, hemispherical or expanded, smooth; stem flexuous; gills adnate, rather distant, pale cinnamon. *A. pusiolum*, Fr. Ep., probably may be amongst the plants I have regarded as belonging to this species. Moist places on moss; very common.

Sub-genus CREPIDOTUS.

Eudermini—pileus horizontal, sub-carnose.

86 A. PALMATUS. E. F. 1. 3. ½.

Pileus when young firm, at length subgelatinous, colour of cedar wood; epidermis disposed in beautiful reticulations; gills thick, radiating from a collar. Spores rough, round, yellow. ·00025. Imbricated. On a squared post in the lane leading from Broad Green to Woolton, two years in succession. There is difficulty with respect to the synonyms of this interesting and rare species, the colour and spores of which seem to indicate an affinity with genus LACTARIUS.

87 A. MOLLIS. Schœff.

Pileus 1—3 broad, 1—2 from the base to the apex, fleshy, flaccid, then dry and tough, downy when young, hygrophanous, pallid; gills watery, then brownish grey. Spores elliptic. ·00045. Common by saw-pits and on fallen timber.

Hypodermini—pileus resupinate, then reflexed, sub-membranaceous.

88 A. VARIABILIS. Pers.

Pileus ½—1 broad, membranaceous, downy, white; gills pinkish. On small sticks in moist places. Rainhill. Patrick Wood. Croxteth.

SERIES IV. **Pratellæ.**

Sub-genus PSALLIOTA.

Lepiotideæ—hymenophore discrete from the stem; gills free.

89 A. ARVENSIS. Schœff. 2—4. 3—12. 1—2.

Pileus very thick and fleshy, smooth or scaly, subglobose, then expanded; gills pale, at length dark purple brown. Distinguished from the next species by its pale gills, and frequently in age by its yellowish stains; it is also a larger and coarser plant. *A. Georgii*. E.F. Commonly known as white caps, or horse mushroom. Pastures. Halsnead. Common in Cheshire.

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90 A. CAMPESTRIS. L. 2—3. 2—5. ¼.

Pileus fleshy, white, stained in age with reddish brown; epidermis often overhanging the margin; gills free, pink, at length purple brown. Commonly known as the mushroom. Found in gardens and in pastures occasionally, but not abundantly, north of the Mersey. Very plentiful in some parts of the Wirrall.

Pholiotidei—hymenophore contiguous with the stem; gills more or less adnexed.

91 A. SEMIGLOBATUS. Batsch. 2—6. ½—1½. 1—1½ lines.

Pileus hemispherical, even, slimy or viscid, yellow; gills broad, sub-horizontal, dark purple brown; stem very slimy, or viscid. Spores elliptic, dark. ·0008. Poisonous. Pastures, on dung; very common.

92 A. ÆRUGINOSUS. Curt. 1—3. 1—4. ⅛—⅔.

Pileus fleshy, rather thin, convex, then expanded, yellowish but often covered with blue slime, making it appear bluish green; gills pale purple brown; stem fibrillose, scaly, bluish green. Under favourable circumstances the pileus is dotted with white warts, and in this state the plant is one of the most beautiful of the Agarics. Very common in gardens, woods, and pastures.

Sub-genus HYPHOLOMA.

93 A. SUBLATERITIUS. Fr. Ep. 3—6. 2—5. ½—¾.

Pileus when young downy, centre bright tawny-red, margin sulphur or citrine-yellow; gills greenish sulphur; stem often becoming stained with red. Spores slightly gibbous, nucleated. ·00033. Tufted or solitary. *A. lateritius*. E.F. Woods, and about stumps; not uncommon.

94 A. FASCICULARIS. Huds. 2—8. 1—2. 2—3 lines.

Pileus at first oval, centre tawny, margin sulphur; gills sulphur, soon assuming a greenish tint, at length dingy olive; stem sulphur or greenish; densely tufted. Spores slightly gibbous, nucleated. ·00035. Stumps, gate-posts, roots of trees, everywhere. The most common of all the Agarics.

95 A. LACHRYMABUNDUS. Bull. 2—3. 2—4. ¼.

Pileus fleshy, thickly fibrillose, dull reddish brown; sub-hygrophanous; gills mingled grey and brown, at length very dark, margin sometimes beaded with drops; stem fistulose, within pale umber. Spores broadly fusiform, very dark. ·0005. Gardens, orchards, and hedges, common.

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96 A. CANDOLLIANUS. Fries. 2—3. 2—3. $\frac{1}{6}$—$\frac{1}{4}$.

Pileus thin, delicate, convex, then nearly plane, dirty white; gills free, very narrow, white, then pink; stem striate. Under hedges early in Autumn. Rainhill. Croxteth.

Sub-genus PSILOCYBE.

Rigidi—stem brittle; pileus hygrophanous.

97 A. SPADICEUS. Fries. Ep. 4—5. 1—3. 2 lines.

Pileus soon fully expanded, centre tawny brown, margin appearing striate; gills dark purple brown; stem glossy white, umber within; densely tufted. *A. stipatus.* E.F. On stumps.

var. b. E.F. 4. 1 broad and high. 1 line.

Pileus campanulate; gills ascending, greyish brown. Solitary. Lanes and gardens.

var. c. E.F. 2. 2. 2—3 lines.

Pileus nearly plane, ochraceo-fuscous; gills clouded; stem mealy. Garden of I. Byerly, Esq., Seacombe.

Tenaces—stem flexible; pileus viscid when moist.

98 A. SEMILANCEATUS. Fries Ep. 2—5. $\frac{1}{2}$ broad, $\frac{1}{2}$ high. 1 line.

Pileus conico-campanulate with an apiculate umbo, margin often contracted, pale ochraceous, viscid or shining; stem tough. Spores elliptic, a hilum at each end. ·0006. Very common in pastures, and by way sides.

Sub-genus PSATHYRA.

99 A. FIBRILLOSUS. Pers. 3. 1 broad, $\frac{1}{2}$ high. 2 lines.

Pileus thin, semioval, fibrillose, hygrophanous; gills grey, at length dark; stem squamulose. Hangsdale's Wood. Knowsley.

Sub-genus PANÆOLUS.

100 A. SEPARATUS. 3—6. 1—1$\frac{1}{2}$ broad and high. 1—1$\frac{1}{2}$ lines.

Pileus semioval, opaque, glazed, clay-coloured, often marked with shallow wrinkles and covered with a sooty film; gills ascending, nearly black. *A. semiovatus.* E.F. Common in pastures on dung.

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101 A. FIMIPUTRIS. Bull. 2—6. 1—2 broad and high. 1—2 lines.

Pileus campanulate, blackish grey with brown shades, margin often delicately fringed; gills ascending, very dark; stem rufescent with a white bloom, often shewing traces of a ring. Spores very broadly fusiform, nearly black, ·00066. Very common on horse-dung.

Sub-genus PSATHYRELLA.

102 A. GRACILIS. Pers. 1½—3. ½—1. ½—1 line.

Pileus thin, campanulate, pale or dingy brown; gills ventricose, margin rose coloured. Lane near Acorn-field Wood. By a sawpit near St. Helens.

103 A. DISSEMINATUS. Pers. 1—2. 3—4 lines. ¼ line.

Pileus ovato-campanulate, striate, frosted, pale fawn, or greyish. Very beautiful, but extremely perishable, soon becoming flaccid. Gregarious. Hundreds on a stump, Rainhill. Thousands covering a bank, Croxteth.

Genus II. COPRINUS.

SERIES. I. Pelliculosi.

Comati—volva concrete with the epidermis of the pileus, at length torn into scales.

104 C. COMATUS. Müll. 4—10. 3—5 high, 2 broad. ½—¾.

Pileus cylindrical, fringed to the apex with whitish cottony scales; gills white, becoming pink and at length black; stem white, hollow, with a loosely woven thread down the centre. Spores elliptical. ·0006. Common in gardens and waste places. A specimen occurred at Bold, 16 inches in length.

Atramentarii—volva none; pileus minutely scaly.

105 C. ATRAMENTARIUS. Bull. 1—6. 2—3 high, 2—4 broad. ½—¾.

Pileus conical or oval, plaited or lobed, at length expanded, with the margin curled upward, grey or brownish; gills purple brown, margin white. Spores subfusiform, very dark. ·0004. When young the plant is firm and heavy, the margin of the pileus reaching to the bottom of the stem. Gregarious or tufted. Very common in gardens and waste places.

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Tomentosi—scales of the pileus floccose, or easily separating.

106 C. FIMETARIUS. L. 4—6. 1—2. 2 lines.

Pileus very delicate, semi-transparent, soon inverted, plicate, squarrose, grey; apex bald; gills linear; stem scaly. Spores broadly fusiform. ·00043. *A. cinereus*. E.F. On compost, sawdust, and by way sides; common.

107 C. NIVEUS. Pers. 2—4. ¼. ½ line.

Pileus conico-campanulate extremely delicate, soon inverted, covered with snowy-white powder. On horse-dung. Rainhill. Eastham.

Micacei—pileus covered with glittering granules.

108 C. MICACEUS. Bull. 2—5. 1—1½ broad and high. 2 lines.

Pileus half oval, striate, furrowed, frosted, fawn, apex darker, margin grey. Roots, bottom of posts, and under trees; very common.

SERIES II. Veliformes.

Cyclolei—stem furnished with a volva, or a ring.

109 C. HENDERSONI. Berk. 1—1½. 2—4 lines. ½ line.

Pileus very fragile; stem furnished with a graceful (moveable?) ring. Rare. Pasture, Rainhill, on horse-dung. October, 1856.

§ b. *Lanatuli—pileus covered with superficial flocci.*

110 C. RADIATUS. Bolt. 1. 1—2 lines. ½ line.

Pileus furrowed, often split into many segments; pale brown. On horse-dung, in a plantation, Rock Ferry.

Furfurelli—furfuraceous or micaceous; apex of the stem generally dilated into a ring.

111 C. EPHEMERUS. Bull. 1—3. ½—1. 1 line.

Resembling *C. fimetarius*, smaller; gills more distant; stem smooth. Dungy places near the coast. Crosby. New Brighton.

112 C. PLICATILIS. Sow. 1—3. ½—1. ½ line.

Pileus delicate, plicate, grey, the folds beautifully radiating from a tawny disc, which at length is depressed; gills fixed to a ring round the apex of the stem. In grassy places; common.

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Genus III. BOLBITIUS.

113 B. TITUBANS. Bull. 4—5. 1. 1 line.

Pileus convex, soon nearly plane, yellowish, viscid; gills narrow, pale cinnamon; stem pale yellow; whole plant subdeliquescent, extremely delicate. Pastures. Bold. Runcorn.

114. B. VITELLINUS. Pers.

On the bank of the river at Runcorn. The Rev. Thomas P. Kirkman.

Genus IV. CORTINARIUS.

Sub-genus PHLEGMACIUM.

115 C. CAPERATUS. Fries. 2—4½. 2—5. 1—1½.

Pileus when young subglobose, then dome-shaped, at length oblate, fleshy, very firm and dry, sub-farinaceous, bright orange tawny; gills when young narrow, then rather broad, close, attenuated at both ends, pale buff, then cinnamon; volva floccose, sheathing the stem, *apparently* concrete with the epidermis of the pileus, unbroken in a specimen 3¾ inches in diameter, portion between the margin of the pileus and the stem coarsely flocculose and strongly plicate, same colour as the pileus, paler below, forming upon the stem reticulations like those upon the stem of *Boletus edulis;* stem ventricose, then cylindrical, very firm; odour like that of oranges. Spores subfusiform. ·00045. Gregarious or tufted. The above description applies to specimens of this magnificent Agaric gathered under trees in a stony place in the park at Bromborough. A specimen was sent to the Rev. M. J. Berkeley, by whom it was identified. The species is announced as an addition to the British Flora, and figured in the "Botany of the Eastern Borders," by Dr. Johnston, 1853.

NOTE.—Cortinarii Mycologos maxime vexarunt." "Stupenda formarum paraffinium copia."—Fries.

116 C. MULTIFORMIS. Fries. 2—3. 2½—3½. ¾.

Pileus convex, viscid, pale yellowish; gills close, slightly serrated, whitish, then dull cinnamon; stem attenuated below, whitish, yellow within, not viscid. *A. turbinatus.* Sow. Knowsley.

117 C. CALLOCHROUS. Pers. 1—3. 3—4. ¾—1.

Pileus fleshy, viscid when moist, convex, dark tawny; gills violet, then ferruginous; stem somewhat bulbous, tinged with violet, lower half like very soft white kid leather. Woods. Eastham. Runcorn. Knowsley.

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118 C. GLAUCOPUS. E. F. 2—5. 2—6. ¾—1¼.

Pileus dark chesnut brown, becoming paler in maturity. Differs from the preceding species chiefly by its broader and more distant gills, and by its beautifully violet coloured flesh. Gregarious. Specimens of unusually large size occurred in Hangsdale's Wood. October, 1857.

Sub-genus MYXACIUM.

119 C. COLLINITUS. Sow. 2—4. 3—4. ¾.

Pileus very slimy, bright tawny, sometimes with dark cinnamon blotches, margin at length wavy; stem studded below with thick gelatinous scales. Gregarious under willow trees, not far from Huyton Quarry.

Sub-genus DERMOCYBE.

120 C. SANGUINEUS. Jacq. 2. 1—1½. 2 lines.

Pileus convex, subfibrillose, margin at length turned up and wavy. Whole plant of a beautiful deep Turkey red. Spores elliptic. ·00038. The gills, when seen obliquely, have a hue which is "rich and rare." Wood near Woolton. October, 1856 and 1857.

121 C. CINNAMOMEUS. L. 2—4. 1—4. ⅛—½.

Pileus convex, then nearly plane, sometimes with a broad umbo, minutely fibrillose, centre deep red cinnamon, margin paler; gills bright yellow cinnamon. Spores broadly elliptic. ·00035. The largest dimensions given are those of tufted specimens found in a wood near Woolton. Woods. Stourton. Knowsley.

Sub-genus TELAMONIA.

122 C. EVERNIUS. Fries. 2—4. 1—2. ¼.

Pileus umbonate, satiny, purplish bay, when dry cream-coloured, margin often whitish; gills broad, at length very distant; stem undulated, white, with a silky lustre. Under beech trees, Rainhill.

123 C. HINNULEUS. Fries. 2—4. 1—3½. ¼.

Pileus and stem more of a cinnamon hue; stem more marked with the fibres of the veil. *A. gentilis.* E.F. Under beech trees, Rainhill. Eastham. Ince, &c.

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Genus V. PAXILLUS.

124 P. INVOLUTUS. Batsch. 2—3. 3—5. ¼—½.

Pileus rather fleshy, plano-convex, then depressed, slimy when wet, smooth like kid when dry; margin when young involute and downy; gills close, decurrent, forming reticulations at the base; stem equal, often curved; whole plant the colour of gingerbread. Common in woods and on banks, especially where the soil is peaty.

125 P.

Pileus 2—3 broad, 1—3 from the base to the apex, sessile, spathulate, or ear-shaped, subimbricate, fleshy, tough, smooth, orange with foxy stains; margin involute; gills when young mere veins, forming reticulations, at length distinct and moderately broad, anastomosing at the base. Spores ferruginous, broadly elliptic. ·00025. On a fallen (poplar?) tree, Knowsley, three years in succession. I am not able to assign this plant to any species I can find described. In substance it resembles *Cantharellus cibarius*. It may probably be allied to *Paxillus crassus*. Fries. Ep. Since writing the above I have found it for the fourth season, and it is now identified with *P. panuoides* by the Rev. M. J. Berkeley. July 18th, 1858.

Genus VI. GOMPHIDIUS.

126 G. GLUTINOSUS. Schœff. 3—4. 2—3. ½.

Pileus convex, at length depressed, olivaceous umber, very slimy; gills pale; stem dirty yellowish. Acorn-field Wood. October, 1856. My notes on this plant are very deficient, and it is inserted somewhat doubtfully.

127 G. VISCIDUS. L. 2—3. 2—4. ½.

Pileus depressed, umbonate, coffee-coloured; gills somewhat darker, with a shade of purple; stem nearly the colour of the pileus. *G. rutilus*. E.F. Plantation between Rock Ferry and Stourton, 1856 and 1857. Acorn-field Wood, 1856.

Genus VII. HYGROPHORUS.

Sub-genus LIMACIUM.

128 H. HYPOTHEJUS. Fries. 2—3. 1—3. ½—¾.

Pileus obtuse, or depressed, yellow, covered with olive slime; gills beautiful yellow. Spores elliptic. ·0003. On the ground in a wood at Croxteth, November, 1855. Under fir trees, Knowsley, November, 1857. Gregarious.

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Sub-genus CAMAROPHYLLUS.

129 H. PRATENSIS. Pers. 1—2. 1—2½. ¼—¾.

Pileus at first convex, margin at length elevated and cracked, reddish buff, somewhat diaphanous; gills beautifully shaded with tints of yellow and reddish buff. Spores nearly round. ·00033. Pastures in the Wirral, and on this side of the Mersey. Esculent.

130 H. VIRGINEUS. Wulf. 1—2. 1. 1—2 lines.

Pileus convex, at length nearly plane, obconic, pure or alabaster white, diaphanous. Spores elliptical. ·0004. Pastures, and amongst grass by road sides; very common. Esculent.

Sub-genus HYGROCYBE.

131 H. COLEMANNIANUS. Blox. 1—1½. 1—1½. 1—2 lines.

Pileus convex, at length nearly plane, reddish buff, somewhat diaphanous, the margin hence appearing striate; gills distant, decurrent, connected by veins, nearly the same colour as the pileus. Spores broadly elliptic. ·00026. I had written this description of a plant which I conceived to be *H. sciophanus*. Fries. I am now glad to recognize it as first introduced into the British Flora by my friend the Rev. A. Bloxam. Grassy banks. Knowsley. Rainhill. Gregarious.

132 H. CERACEUS. Wulf. 2—3. 1. ½.

Pileus thin, slightly convex, diaphanous, whole plant yellow. Pastures; not uncommon.

133 H. COCCINEUS. Wulf. 2. 1—2. 4 lines.

Pileus conico-campanulate, often inverted. Bright yellow, orange, or scarlet. Spores elliptic. ·0003. Very common in pastures.

134 H. MINIATUS. Fries. 1. ½—1. 1—2 lines.

Pileus convex, then umbilicate, dry; colour often very intense, scarlet. Pastures on a peaty soil. Prescot Carrs. Knowsley, &c.

135 H. CONICUS. Schœff. 2—3. 1—1½ high. 2—4 lines.

Pileus conic, lobed; bright orange, red, or brown, becoming black; generally black at the apex. Spores very slightly reniform. ·0004. Pastures, especially amongst the sand-hills; common.

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136 H. CALYPTRÆFORMIS. Berkeley. 3—4. 1—1½ high. ½.

Pileus acutely conic, margin a little expanded, sometimes splitting to the apex, not viscid, gills ascending; pileus and gills beautiful pale rose; stem smooth, diaphanous, pure white, sometimes longitudinally split, and hence compressed. Spores elliptic. ·0003. One of the most beautiful and rare Agarics. Mr. Berkeley announces it as a species new to Britain, No. 63 of the series in the Annals, remarking that Lasch is the only author who has noticed it. Pasture, Knowsley Park. November 5th, 1857.

137 H. PSITTACINUS. Schœff. 2—3. 1—1½. ¼.

Pileus campanulate, often expanded and umbonate. Whole plant very slimy, variegated, bright yellow and green. Spores elliptic. ·00028. Generally distributed.

138 H. UNGUINOSUS. Fries. 2—3. 1—1½. ¼.

Livid; a copious sticky slime covers the pileus, and the hollow flexuous stem. Occasionally in pastures, Knowsley, and near Eastham, but not common.

Genus VIII. LACTARIUS.

SERIES I. Piperites.

§ a. *Pileus viscid, margin at first involute, tomentose.*

139 L. TURPIS. Weinm. 1—2½. 3—6 or even 8. ½—1.

Pileus hard, viscid, plane, with an involute floccose margin, afterwards expanded, centre rather sharply depressed, margin bare; frequently not zoned, dirty dark olive colour; gills brownish yellow, very close; milk acrid. Spores round. ·00033. *A. torminosus. E.F.* Woods. Woolton. Acorn-field. Eastham.

140 L. CILICIOIDES. Fries. 1—2. 3—5. 1—1½.

Pileus depressed, dirty whitish or cream colour, margin at first involute, tomentose; gills forked, crisp, juiceless, whitish, with verdegris stains. Spores rough, round. ·00036. Closely allied to *A. exsuccus. E.F.* Abundant in Acorn-field Wood.

§ b. *Pileus viscid, pelliculose, margin naked.*

141 L. BLENNIUS. Fries. 1—1½. 2—4. ½.

Pileus pitted, marked as if with rain-drops, dusky, with a greenish tinge; gills white. Under beech trees, Rainhill. Runcorn.

§ c. *Pileus without a pellicle, hence quite dry.*

142 L. PLUMBEUS. Bull. 3. 5. 1.

Pileus deeply infundibuliform, dry, dark grey. Under beech trees, Rainhill. October, 1856.

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143 L. PYROGALUS. Bull. 1½. 2—3. ½.

Pileus pale livid, zoned; gills distant, yellowish, milk acrid, very abundant. In a riding, Croxteth Wood. Amongst grass, Hangsdale.

144 L. PIPERATUS. Scop. 1—3. 3—7. 1—2.

Pileus infundibuliform, white, smooth. Park, Little Crosby. September, 1856.

SERIES II. Dapetes.

145 L. DELICIOSUS. L. 3. 3—4. ½.

Pileus and gills whitish orange, in age stained with green; stem marked as if with drops, milk abundant, bright orange. Plantation between Rock Ferry and Stourton. Garden of John Dennison, Esq., Woolton Hill.

SERIES III. Russulares.

§ a. Milk changing colour.

146 L. CHRYSORHEUS. Fries. 1—2. 2—3. ½—½.

Pileus dry, mealy, bright buff; milk white, turning on exposure to the air to a beautiful yellow. Spores rough, round, yellow. ·0003. Abundant in a riding, Acorn-field Wood.

147 L. ACRIS. Bolt. 1½—2. 3—6. ¾—1½.

Pileus depressed, unequal, indistinctly zoned, viscid, lurid, or dusky; gills yellowish; stem much attenuated downwards. Spores rough, round. ·00033. Under beech trees, Rainhill.

§ b. Milk permanently white.

148 L. QUIETUS. E. F. 2—3. 2—3. ½—½.

Pileus obtuse, afterwards depressed, dry, mealy, colour of cedar wood, margin deflected; stem firm, milk mild, odour none. Spores rough, round. ·00035. The most common of the milky Agarics. Woods and hedge-banks everywhere.

149 L. SUBDULCIS. E. F. 1—2. 1—3 ½.

Pileus plane, or much depressed, rather thin, dark chocolate; gills deep red brown; stem becoming hollow; odour powerful, sweet but nauseous. Spores rough, round. ·00033. Hangsdale's Wood. Croxteth.

150 L. AURANTIACUS. Fries. 1—1½. 2—3. ½.

Pileus thinly fleshy, plane, then depressed or almost infundibuliform, smooth, slightly viscid, bright orange; gills very decurrent, not so bright as the pileus; stem smooth, stuffed, orange. This seems to me so distinct that I cannot assign it to any species in the E.F., though Mr. Berkeley seems to have found a plant somewhat similar, and mentions it as a variety of *A. subdulcis*. Under beech trees, Rainhill. Stourton.

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151 L. RUFUS. Scop. 2½. 3—4. ½.

Pileus depressed, at length infundibuliform, often with a small umbo; deep brick red, milk acrid. Fir woods. Stourton. Bidston. Rainford.

152 L. GLYCIOSMUS. Fries. 1½. 2½. ½.

Pileus pale, lurid; gills yellowish. Known by its strong scent, like that of oranges. Hangsdale's Wood. October, 1856.

Genus IX. RUSSULA.

153 R. NIGRICANS. Fries. Ep. 2—3. 3—6. ¾—1½.

Pileus pale yellowish brown, with dirty olive stains; gills rounded behind, brittle, very thick and distant. The whole plant becomes coal black without losing its shape or firmness. *A. adustus*, *E.F.* Woods. Eastham. Woolton. Hangsdale. Knowsley.

154 R. VESCA. Fries. 2—3. 3—5. ½—1.

Pileus convex, at length expanded, centre depressed, smooth and somewhat viscid when young, in age slightly rugulose, with a sub-striated margin; gills rather broad and distant, occasionally forked, white; stem firm, rivulose, white or tinged with the colour of the pileus which is extremely variable, purplish bright or pale red, livid, yellowish or white. *A. emeticus*, E.F. in part. The difficulty is great of assigning this, the most common of all the Russulæ, to any species named in the Epicrisis. *R. vesca* is, however, *A. integer*, of Bolton, plate 1; which is also *A. emeticus*, E.F.

155 R. VIRESCENS. E.F. 2. 4. ½—¾

Pileus rugulose, centre depressed, greenish with olive purple or yellow shades; gills forked, white; stem firm, white. Following the synonyms I have, in the List of British Hymenomycetes, assigned this species to *R. heterophylla*, the description of which in the Epicrisis does not accord with that of A. virescens in the E.F. The present species may easily be known by the rugulose surface of the pileus, over which there is an extremely thin glazed pellicle. In woods not uncommon.

156 R. RUBRA. Fries Ep. 2. 3—5. 1.

Pileus depressed, smooth, bright rose colour; gills forked, white; stem unequal, paler than the pileus. Whole plant very firm. Under trees, Halsnead Park.

157 R. FŒTENS. Pers. 3—4. 4—6. 1.

Pileus much depressed, colour of pie-crust, but dirty looking, margin furrowed and tuberculated. An untidy looking plant, appearing under trees and on hedge-banks early in autumn, and lasting but a short time.

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158 R. ALUTACEA. Pers. 1—2. 3. ¼—1.

Pileus depressed, fleshy, viscid when moist, variously coloured red, purplish, or ochraceous; margin at length furrowed; gills equal, pale buff. Spores rough, round, yellow. ·00045. Woods in many places.

159 R. NITIDA. Pers. 1—2½. 2—3. ½—¾.

Pileus thin, almost membranaceous, viscid, mostly ochraceous; margin furrowed; gills distant, yellowish. Spores round. ·00035. Woods in many places.

Genus X. CANTHARELLUS.

160 C. CIBARIUS. Fries Ep. 1—1½. 1—3. ¼.

Pileus smooth, thin, fleshy, rather tough, infundibuliform; margin uneven; gills subdistant, branched. Whole plant orange buff. Spores elliptic, white. Eastham Wood, in one spot only, where it was very abundant in 1856.

161 C. AURANTIACUS. Fries Ep. 1. 1—1½. ⅛.

Pileus sub-tomentose, repand; gills rather close and but little forked, pale or reddish buff. Solitary specimens found under a hedge, Rainhill, and on a bank, Knowsley. My notes are deficient, and the plants referred to possibly may have been ill grown specimens of *C. cibarius*.

Genus XI. MARASMIUS.

Sub-genus COLLYBIA.

162 M. PERONATUS. Bolt. 2—3. 1—3. 2—3 lines.

Pileus tough, at length expanded; pileus and gills the colour of a faded oak leaf; stem at the base thickly clothed with pale yellow down. Amongst leaves in woods, especially Eastham wood.

163 M. OREADES. Bolt. 1—2. ½—1. ⅛.

Pileus convex, or broadly umbonate, tough, pale buff; gills distant, pale; stem fibrous, base downy. Spores broadly elliptic. ·00033. Pastures, frequent throughout the year; abundant on banks in the Wirral. Often found in rings, whence it has been called the *Fairy ring Agaric*, though it is by no means the only species with this habit. It is also known by the name of *Scotch Bonnets*. "Though tough, much used as an article of food on the continent, and occasionally in this country, but too frequently very different and poisonous fungi are gathered under the name."

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164 M. VAILLANTII. Fries. 1. ½. ½ line.

Pileus white; gills rather thick, sub-distant, adnato-decurrent; stem pale, darker below. Bromborough Wood, on fallen twigs amongst moss.

165 M. RAMEALIS. Bull. 1. ½. ½ line.

Pileus nearly plane, wrinkled, cream-coloured; stem pale. Very common on sticks in moist places.

Sub-genus MYCÆNA.

166 M. ANDROSACEUS. L. 1—3. ½. ½ line.

Pileus the colour of a faded oak leaf; gills resembling veins; stem tough, black. On leaves, especially oak leaves. Knowsley, Eastham. Very abundant in a plantation on the private road to Stourton.

Genus XII. LENTINUS.

167 L. COCHLEATUS. Pers. 1—1½. 1—2. ¼.

Densely tufted, colour of pie-crust, darker and redder with age. Pilei seldom entire, two or three springing from the same stem, and overlapping each other like the petals of a flower, surface rough with prickly pimples; gills decurrent to the base of the curved stem on which they are confluent in groups, forming a strongly fluted surface; substance rather firm, corky when dry. A beautiful and rare species. Found covering a stump in Acorn-field Wood. October 1857.

Genus XIII. PANUS.

168 P. CONCHATUS. Fries.

Stem hardly any; Pileus 3 broad, 4 from base to tip. Pileus thin, tough, of even thickness throughout; flesh-colour; gills distant, quite simple. On a stump in a timber-yard, Bold. October, 1857.

169 P. STYPTICUS. Bull. ½. 1—1½. 2 lines.

Pileus thin, dry, tough, subinfundibuliform, rarely equal, colour of Nankin; gills close, nearly the same colour as the pileus; tufted or subimbricated. Spores oblong. ·00014. On fallen trees, Bold, Halsnead, Eastham, &c.

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170 P. INCONSTANS. Fries S.M. ½. 4. ⅛.

Pileus thin, slightly lobed, infundibuliform, excentric, fawn-colour, shining, wrinkled and hard when dry; gills close, anastomosing and forming lozenge-shaped reticulations at the base. I am doubtful as to the position of this species, not being able to find it in the Epicrisis. Hangsdale's Wood. September, 1857.

Genus XIV. SCHYZOPHYLLUM.

171 S. COMMUNE. Fries.

Pileus 1—1½ broad, 1—1½ from the base to the margin, thickly tomentose, thin, dry, very tough, densely imbricated; margin involute, even, lobed or digitate, white or grey; gills reddish grey; stem short or none. This most beautiful fungus is said to be a native of almost every part of the world. It is found in great profusion in the timber-yard, Halsnead, almost covering the trunks of beech trees, and growing also, but more sparingly, on oak and ash.

Genus XV. LENZITES.

172 L. BETULINA. L. 2—4 broad. Dædalia betulina. E.F.

Solitary or imbricated, sometimes confluent, and extending a foot or more in breadth. Pileus dimidiate with raised zones, velvety, ashy-grey; gills radiating, with shorter ones interspersed towards the margin, hard, tough, often cracked, paler than the pileus. I have not been able to detect the spores of this very handsome species, nor do I find them described. On birch, Knowsley. On barked oak, near St. Helens.

FAM. II. *POLYPOREI.*

Genus XVI. BOLETUS. L.

Sub-genus OCHROSPORUS.

1. B. LUTEUS. L. 3—4. 3—4. ½—¼.

Pileus convex, dingy yellow, covered with brown slime or merely viscid; tubes adnate yellow; flesh white, not changing colour; stem firm, sordid yellow, whitish and punctato-scabrous above the ring. Not uncommon in woods.

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2 B. ELEGANS. var. FLAVUS. Fries Ep.

"Known by its firm, bright yellow pileus, the flesh of which is also yellow, by its golden sulphur coloured decurrent tubes, and by the portion of the stem above the ring being reticulated and not glandular." *B. Grevillei.* E. F. Woods and plantations. Pex-hill. Stourton. Knowsley.

3 B. BOVINUS. L. 2—3. 1—3. ¾.

Pileus convex, glutinous, pale reddish buff; flesh whitish, unchangeable; tubes shallow, slightly decurrent; stem even, pale. In abundance in the fir plantations at Stourton and Bidston.

4 B. PIPERATUS. Bull. 2—3. 1—3. ¼.

Pileus at length nearly plane, viscid, yellowish; flesh yellow, unchangeable; tubes large, angular; stem yellow. In a wood on Windle moss.

5 B. VARIEGATUS. Swartz. 2—3. 3—4. ½—¾.

Pileus fasciculato-pilose, dull yellow; tubes narrow, adnate, buff yellow. Fries describes them as ferruginous; in the E.F. they are said to be dull yellow; I have not seen them ferruginous. Flesh and tubes, when broken, becoming bluish. Fir plantations, Stourton.

6 B. SUBTOMENTOSUS. L. 2—4. 2—4. ½—¾.

Pileus slightly convex or uneven, covered with a dull olive tomentose epidermis, cracking into areolæ; interstices yellow or whitish; tubes rather large, sub-fusiform, yellow; stem scabrous, curved, often deep crimson red below, towards the apex yellow; flesh changing slightly and not very rapidly to a bluish tint. Common under hedges, and on woody banks.

7. B. CHRYSENTERON. Bull.

Differing from the preceding species principally in the smoother stem, and in the cuticle of the pileus, which is red. Under trees, Rainhill. Bold.

8 B. LURIDUS. Schœff. 2—4. 3—5. 1—1½.

Pileus sub-tomentose, olivaceous umber; flesh yellowish, changing rapidly to blue; tubes nearly free, yellow; orifices crimson-red, at length orange-red; stem ventricose, reticulated or streaked with red; very poisonous. Under beech trees, Rainhill. Boletus Satanas has probably occurred in the same locality; my notes are deficient, and only mention a cream-coloured variety of B. LURIDUS.

9 B. EDULIS. Bull. 2—4. 3—6. 1—2.

Pileus at first pulvinate, chocolate brown; pores half free, whitish, becoming yellow; stem strong, pale, reticulated; Sporules large, greenish, ochre, E.F. Under beech trees, Rainhill; near Warrington. In Cheshire, not uncommon.

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Sub-genus DERMINUS.

10 B. SCABER. Bull.

This and the preceding may be distinguished from most other British species, especially when young, by the white tubes, and the substance, which is remarkably solid and heavy. From B. edulis, B. scaber differs in having a viscid pileus, free tubes, a squarrose stem, and, according to Fries, dull ferruginous spores. Under beech trees, Rainhill.

Genus XVII. POLYPORUS. Mich.

Sub-genus MESOPUS.

11 P. LENTUS. Berkeley.

Stem ½—1 high. ⅛—⅛ diam. Pileus 1—3 broad. Toughly fleshy; pileus sub-depressed, reddish-brown, slightly scaly, when young; stem at first central, at length more or less excentric; pores large from the first, somewhat radiately disposed, angular, very decurrent; in a growing state the dissepiments are thick, and have a central paler trama. Spores oblong, white. ·0006. Copiously given off in drying. This species was gathered by the Rev. M. J. Berkeley on living ulex Europæus in 1832. I do not find it noticed by any other author, unless it be the *Polyporus coronatus* of Rostkovius figured in Sturm's Deutschlands Flora. It may probably belong to the genus Favolus of Fries. Found on living ulex Europæus at Eastham, Stourton, and the warren, New Brighton.

12. P. LEPTOCEPHALUS. Jacq.

Stem ½ high. ⅛ diam. Pileus 1 broad. Between fleshy and coriaceous, fawn-coloured, nearly plane; pores minute, whitish. Found on a tree in Cheshire by I. Byerley, Esq.

13 P. PERENNIS. L.

Stem 1 high. ¼ diam. Pileus 2—3 broad. Coriaceous, thin, infundibuliform, cinnamon, zoned; stem thickened downwards, velvety. Eastham Wood, August, 1856.

Sub-genus PLEUROPUS.

14 P. SQUAMOSUS. Fries.

Stem 1—3. 1—2 diam. Pileus 3—16 broad. Tough, elastic, fleshy, fan-shaded, or expanso-spathulate, ochraceous with broad, dark-brown scales; pores at first minute, then large, angular, pale. Common on decayed trees and stumps.

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15 P. VARIUS. Pers.

Stem 1. ½ diam. Pileus 1—3 broad. Tough, soon rigid, disc depressed behind, pale or deep red brown; pores minute, decurrent; stem curved, abruptly black at the base. On a stump, Sutton, Cheshire. On a fallen tree, Bromborough.

16 P. ELEGANS. Fries Ep. var. NUMMULARIUS.

Stem ½ high. Pileus 1 broad. Soon rigid; disc smooth, nearly white, sub-orbicular; stem slender, abruptly black towards the base; pores minute, round, yellowish. Not hitherto described as British. On an Alder tree, Hooton, Cheshire.

17 P. QUERCINUS. Schrad.

5 from the margin to the base. 4 broad. Pileus corky, tongue-shaped, narrowed towards the horizontal base, floccose, smooth, pale yellow brown; pores minute, short whitish. A beautiful and distinct species. On a very ancient oak, Knowsley.

Sub-Genus MERISMA.

Carnosi.—pileoli stipitate, centrally cæspitose; disc floccoso-fibrous.

18 P. FRONDOSUS. Fries.

From 4 to 16 inches in diameter. Growing in semiglobose or irregular tufts, much branched; pileoli numerous, sub-dimidiate, an inch, in large specimens 2 or 3 inches broad, smoky grey; margin thin; interior of the tuft appearing as if chiselled in fine white stone. On the ground under, and in cavities at the base of, oak trees, Knowsley. One large specimen grew on an Alder.

Lenti.—pileoli substipitate, more or less zoned; tufts lateral, toughly fleshy.

19 P. GIGANTEUS. Fries.

Tufts much imbricated, round, or spreading laterally; pileoli 3—8 inches broad, pale chestnut-brown, zoned; margin very blunt; pores minute, cream-coloured, dark when bruised. Under trees, Knowsley. Covering the roots of a beech for many feet, Croxteth.

Caseosi.—tufts commonly dimidiate; pileoli not zoned; substance cheese-like, hard when dry.

20 P. SULPHUREUS. Bull.

Pileoli 1—5 inches broad, undulated, of even thickness, densely imbricated, bright buff, with shades of reddish orange; pores sulphur. On oaks, Knowsley. On a gate-post, Penketh.

Suberosi.—tufts sub-sessile, either central or lateral; pileoli coriaceous or corky.

21 P. CRASSUS. Fries.

Tuft consisting of about 5 pileoli, resembling in form those of *P. giganteus*, but in substance much harder, and scarcely stipitate. Upper surface velvety, dusky-grey, sub-zoned, margin pale; pores minute, greyish white; growth of tuft somewhat prone. On the root of a larch, Bromborough.

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Sub-genus APUS.

Anodermei.

Carnosi.—substance soft, cheese-like; pores white.

22 P. MOLLIS. Fries.

½—1 from the margin to the base. 1—1½ broad, but often extended laterally for 3 or 4 inches. *Concavely* triquetrous; substance white, very easily broken, but not watery; disc slightly fibrous, cream-coloured or pinkish, with indistinct testaceous zones; pores whitish, unequal, flexuous; orifices sharply toothed; base very broadly effused. Spores oblong, curved, with two nuclei. ·00016. On a fallen fir tree, Knowsley.

Lenti.—substance carnoso-coriaceous; pores coloured.

23. P. ADUSTUS. Willd.

1—2 from the margin to the base. 2—3 broad. Imbricated; disc villous, pale grey; margin thin, becoming black; pores short, minute, grey, whitely pruinose, obsolete towards the margin. On stumps, common.

24 P. CRISPUS. Fries.

½—1 from the margin to the base. 1—3 broad. Pileus coriaceous, imbricated, when young narrowly reflexed, floccoso-rugose, zoneless, at length dusky, with a marginal brown zone. Often effuso-extended for a foot or more vertically, with somewhat distant pilei. Not, so far as I am aware, hitherto recorded as British. Kindly named for me by the Rev. M. J. Berkeley, who remarks that the pores are smaller than usual, and that the species is closely allied to *P. Adustus*. On aged, living whitethorns, Knowsley.

Spongiosi.—substance spongy, becoming hard; hispid.

25 P. HISPIDUS. Bull.

2—5 from the margin to the base. 3—6 broad. Pileus dimidiate, thick, very hispid, dark ferruginous; margin obtuse; under surface often variously swollen; pores minute, yellowish; substance dark bay. Common on trunks of living trees.

26 P. SPUMEUS. Sow.

1—2 from the margin to the base. 1—3 broad. Pileus dimidiate, or with a constricted, short stem; gibbous, rugulose, slightly hispid, whitish; pores and substance whitish. Decaying trees, Bold, Knowsley.

Placodermei.

Suberosi.—substance juicy, becoming indurated; crust thin; perennial, but not increasing after the first season.

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27 P. DRYADEUS. Pers.

3 broad. 1 thick. Compact, smooth, disc greyish cinnamon; pores even, minute, cinnamon; margin tumid, forming a raised border round the pores. The descriptions of this plant in the S.M. and in the Epicrisis do not well agree. My specimen, in which there are two pilei growing together in an imbricated manner, corresponds well with the description in the S.M. On a branch of an oak which had been blown down. Croxteth, 1856.

Fomentarii.—substance hard from the first, increasing annually by layers.

28 P. SCOTICUS. E.F.

2—3 from the margin to the base. 3—4 broad. Disc rugosely radiated, bright foxy red; margin and pores white. Many pilei often unite and together with the effused layers of pores form a large, irregularly shaped mass. On roots, frequently in rabbit burrows, or at the base of stumps, principally where the soil is peaty. Woolton, Croxteth, &c.

29 P. IGNIARIUS. L.

Pileus at first tuberculate, globose, then hoof-shaped, smooth, margin rounded, upper surface bleached ferruginous; pores cinnamon; whole plant extremely hard. On a plum-tree, Rainhill. On a wild cherry-tree, Hooton, Cheshire.

30 P. SALICINUS. Fries.

Disc narrow, rough, covered with a thick black crust; widely and broadly resupinate; pores cinnamon, whole plant extremely hard. On a willow on the road to Hoylake.

Inodermei.

Stuposi.—sub-coriaceous; pileus uneven, zoneless.

31 P. RADIATUS. Sow.

2—3 from the margin to the base. 2—4 broad. Pileus hard, when young tuberculose, velvety, tawny, at length subtriquetrous; disc rugosely radiated, bright ferruginous; margin pale; pores minute, yellowish, with a tinge of olive and when in fine condition with a silvery sheen; imbricated, often extending vertically for a yard or more, and presenting a very beautiful appearance. On decaying alder trees, Knowsley, and at Ince Blundell.

32 P. CERVINUS. Pers.

1 from the margin to the base. 3—6 broad. Coriaceous; pileus thin; disc somewhat velvety, indistinctly zoned, rich dark brown; pores large, some of them long, descending orifices very oblique, pale woody colour. On the trunk of a fallen beech, Woolton Wood. More commonly found wholly resupinate, with pale, woody, sinuous pores. On the under side of fallen branches. I am indebted for the name of this species to the Rev. M. J. Berkeley, through the kindness of the Rev. A. Bloxam.

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Coriacei.—coriaceous; pileus even, zoned.

33 P. VERSICOLOR. L.

1—2 from the margin to the base. 1—3 broad. Imbricated, thin, plane, or somewhat concave, elastic, velvety, conspicuously zoned; pores small, round, white or cream-coloured. Sometimes spuriously stipitate. Extremely variable in colour, pale fawn with greyish zones, deep rich brown with paler zones, almost black with blackish blue zones, greenish white; other varieties occur. The most common of the Polypores. On stumps and posts everywhere.

34 P. ZONATUS. Fries.

Not hitherto, as far as I am aware, recorded as British, having undoubtedly been regarded as a variety of the preceding species. I think, however, we have a plant agreeing in every respect with the description of P. zonatus in the Epicrisis, and with the figures of this species in Schæffer and the Deutschlands Flora. "Pileus between coriaceous and corky, posteriorly convex and tuberculoso-gibbous, sub-zoned, thickly villous, margin becoming white; pores minute, round or angular, obtuse, whitish. Found in all countries."—Epicrisis. Moreover the distinguishing character of P. versicolor in the Epicrisis, "depresso lævigato velutino nitido, zonis discoloribus variegato," cannot apply to the plant in question, which is not so common as P. versicolor, but is found occasionally, principally on rails.

35 P. ABIETINUS. Fries Ep.

$\frac{3}{4}$ from the margin to the base. 1—2 broad. Pileus very thin; disc villous, greyish white; pores small, toothed, lilac, or violet; often broadly resupinate and but little reflexed. On fallen fir trees, common.

Sub-genus RESUPINATUS.

36 P. MEDULLA-PANIS. Jacq.

Of uneven thickness, firm, dry, whitish; margin defined; pores upon an even horizontal surface rather short, small and round. On a decayed sleeper, Spittal station.

37 P. VULGARIS. Fries.

Thin, closely adhering to the matrix; margin tomentose, soon smooth; pores firm, very small, round, white. On decayed posts, Knowsley.

38 P. MOLLUSCUS. Pers.

Thin, soft, snowy white; margin deeply byssoid; pores unevenly developed, very small, round, orifices lacerated. On decayed wood, Knowsley.

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39 P. VAPORARIUS. Fries Ep.

Almost entirely consisting of middle sized, angular, pale tan coloured pores, orifices lacerated. My specimens were kindly named for me by the Rev. M. J. Berkeley. Very common on fallen branches and decayed logs.

40 P. VAILLANTII. Fries.

Effused, thin, byssoid, whitish; pores here and there in clusters, angular, unequal. Covering the base of a stump, and spreading over mosses and small sticks. Woolton Wood. Eastham.

Genus XVIII. DÆDALEA. Pers.

41 D. QUERCINA. L.

2—4 broad. Pileus dimidiate, of a pale, woody appearance, bald, marked with concentric raised or depressed zones and little radiating wrinkles; the margin in well-grown specimens is thin, but in ill developed individuals swollen and blunt; gills of the same colour as the pileus, woody, thick, sinuous, and anastomosing so as to form long wavy pores a line or more broad. I have taken this description from the English Flora, having never seen the plant in a well developed state. Timber yards, Bold, Halsnead.

42 D. UNICOLOR. Bull.

1—2 broad. 1—1½ from the base to the apex. Pileus thin, dimidiate, zoned, villous, grey; pores small, flexuous, unequal; dissepiments thin, often uneven. Resembling *P. zonatus*, but distinguished by its flexuous pores. On stumps in woods, Bold, Hangsdale.

Genus XIX. MERULIUS. Haller.

43 M. CORIUM. Grev.

1—2 broad. Resupinate, confluent, or reflexed and imbricate; pileus villous; margin tomentose, white; hymenium cream-coloured; pores small, sinuous, sometimes indistinct. Spores oblong. ·00038. Whole plant soft, and easily torn. On stumps and decayed branches late in autumn.

44 M. PALLENS. Berk.

Effused, between gelatinous and fleshy, pale reddish, folds forming shortly sinuous pores; spreading for many inches on fallen and decayed branches. The plant almost disappears in drying. Knowsley, 1856.

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45 M. CARMICHÆLANUS. Grev.

Resupinate, very thin, greyish brown; pores small, regular. The only specimen I have seen was gathered at Knowsley on a fallen branch, and sent to the Rev. A. Bloxam, by whom it was referred to this species.

46 M. LACHRYMANS. Wulf.

The mycelium of this plant often attains a very extensive growth, forming large soft snowy-white patches, which at length shrink into a drab-coloured web. The hymenium, when developed, is very beautiful, being of a bright sub-olivaceous orange, and forming unequal, shallow, poriform depressions, which are often beaded with limpid drops. On beams, planks, wainscotting, timber, &c., where the ventilation is imperfect.

Genus XX. FISTULINA. Bulliard.

47 F. HEPATICA. With.

Pileus 3—12 broad. Dimidiate or tongue-shaped, entire or lobed, fleshy, juicy, flesh veined, colour of beef; tubes minutely dappled, red and ochraceous. Trunks of old oaks, Eastham. Knowsley. Bold.

FAM. III. *HYDNEI.* Fries.

Genus XXI. HYDNUM. L.

1 H. REPANDUM. L. 1—3. 2—4. ½—1.

Pileus fleshy, convex, uneven or lobed, cream-colour or pale buff; spines unequal, delicate pale flesh colour; stem pale, often excentric. Spores nearly round. ·0003. Terestrial. Edible. Woods. Woolton. Acorn-field. Under beech-trees, Rainhill.

2 H. AURISCALPIUM. L.

"Pileus coriaceous, horizontal, downy, notched at the point of insertion of the lateral tomentose stem." E.F. Inserted on the authority of George Graves, Esq., the artist of the *Flora Londinensis*, who informed me that he had found it on fir cones in the plantations, Stourton.

3 H. FARINACEUM. Pers.

"Forming thin effused patches resembling scattered meal, beset with distant acute spines."—E.F. On decayed oak in my garden, Rainhill.

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4 H. UDUM. Fries.

Effused, sub-gelatinous, watery yellow, here and there reddish; spines close, unequal. Forming large patches on fallen branches in watery places. Patrickwood. Bromborough. Sutton.

Genus XXII. RADULUM. Fries.

5 R. ORBICULARE. Fries.

Effused, orbicular, confluent; margin byssoid; tubercles in patches, some much elongated, flattened; pale woody colour. Growing largely, in a vertical position, on a stump near Childwall.

Genus XXIII. PHLEBIA. Fries.

6 P. RADIATA. Fries.

Between fleshy and membranaceous, orbicular, at length confluent and extended, purplish flesh colour; folds "elongated papillæ," radiating, short, vanishing towards the margin; circumference adorned with an exquisite fringe of erect fibres, shining like asbestos, bright orange, white towards the base, ¼ of an inch in length. The most beautiful of the tribe, retaining its colour well in drying. On fallen birch branches Knowsley.

Genus XXIV. GRANDINIA. Fries.

7 G. PAPILLOSA. Fries.

Thin, whitish, cracked into areolæ; margin somewhat indefinite; granules sub-conical. On the bark of fallen branches, Knowsley.

Genus XXV. ODONTIA. Fries.

8 O. FIMBRIATA. Pers.

Effused, membranaceous, between flesh colour and ferruginous; margin white, fringed; spines small, multifid. *Hydnum fimbriatum.*—E.F. On a fallen branch, Croxteth.

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Fam. IV. *AURICULARINI.* Fries.

Genus XXVI. CRATERELLUS. Fries.

1 C. SINUOSUS. Fries. 1—2. 2—3. ½.

Pileus dry, scarcely fleshy, infundibuliform or compresso-infundibuliform, smooth, brownish grey; margin very much sinuated; hymenium much veined, pale grey; stem stuffed, attenuated downwards. *Cantharellus sinuosus.*—E.F. Eastham Wood, 1855 and 1857, plentiful in one spot.

2 C. CRISPUS. Bull. 1—2. 2—3. ½.

Pileus aquoso-carnose, infundibuliform, smooth, pale umber; margin much sinuated; hymenium veined. Considered by Fries to be a variety of the preceding species; it however differs much in substance. Sowerby's figure is very exact. Found at Southport in great abundance on a moist, grassy, flat portion of the shore, which is covered by the highest tides.

Genus XXVII. THELEPHORA. Ehrh.

Sub-genus MESOPUS.

3 T. CARYOPHYLLÆA. Fries.

Pileus depressed, infundibuliform or flabellate, purple-brown; margin incised; hymenium nearly smooth. Plant an inch high. No. 283 in the Annals. On the roots of Salices, sand-hills, Crosby.

Sub-genus APUS.

4 T. CRISTATA. Pers.

At first decumbent, spreading, whitish; ramuli cæspitose, ascending; apices fringed; hymenium minutely striato papillose. Growing over leaves, &c., forming a rather large patch at the base of a larch tree, Eastham Wood.

5 T. LACINIATA. Pers.

Pilei sub-imbricated, flabellate, somewhat rough with innate fibres; chocolate brown, 1 to 1½ high; margin laciniate; hymenium flocculose, papillose. On the ground in fir plantations, common.

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Sub-genus RESUPINATUS.

6 T. PUTEANA. Schum.

Effused, sub-orbicular, sub-carnose, tender, sub-tuberculose or nearly smooth; margin broad, soft, whitish; hymenium towards the margin yellowish; centre bright, olivaceous tawny. On the under side of a plank leaning against a damp wall, and in other similar situations.

7 T. ARIDA. Fries Ep.

Effused, membranaceous, paler than the last, dry. Spores elliptical. ·0005. On aged whitethorns, Knowsley. The hymenium seems to be developed only on the wood, but the plant spreads over the bark, nestling in the crevices, and extending more or less continuously for many feet.

Genus XXVIII. STEREUM. Fries.

Sub-genus APUS.

8 S. PURPUREUM. Pers.

Sub-coriaceous, imbricated; reflexed disc, strigose, zoned, whitish; hymenium smooth, purplish or lilac. A variety occurs which is broadly effused, margin narrowly reflexed, hymenium brownish lilac. Common on timber, stumps and posts.

9 S. HIRSUTUM. Willd.

1—2 broad. ½—1½ from the margin to the base. Coriaceous, imbricated, disc strigose, zoned, yellowish; margin rather blunt; hymenium smooth, luteous, retaining its colour or entirely faded when dry. The most common of the tribe, abounding everywhere on fallen trees and posts. Very variable, but for the most part easily known by its bright buff or egg yellow hymenium.

10 S. SPADICEUM. Fries.

½—1½ from the margin to the base. 1—2 broad. Coriaceous, confluent, imbricated, disc somewhat zoned, or radiately strigose, cinnamon; margin velvety, pale; hymenium smooth, reddish umber, blood-stained when bruised; substance white within. Not uncommon on fallen trees, especially oaks. If I have rightly apprehended the limits of this species, it is even more variable than the preceding one. I have a specimen which might almost claim to be placed in the group Merisma, the pileoli being numerous and entire; the margin is often much sinuated and crisped; the hymenium nodulose or with long anastomosing tubercles. The plant often occurs with a good deal of

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the appearance of *S. tabacinum*, from which species it is distinguished by a firmer texture, smooth hymenium, and white inner substance.

11 S. SANGUINOLENTUM. Alb. and Schw.

Coriaceous, thin, effused, narrowly reflexed, disc sericeous, pale; hymenium smooth, colour of willow-wood, blood-stained when cut or torn. On fallen fir branches, Halsnead, Stourton.

12 S. RUBIGINOSUM. Schrad.

Imbricated, rigid, reddish brown, many growing together and into each other; while young, resupinate; hymenium subvelvety, rubiginose, margin pale; when old, reflexed, the reflexed portion more or less zoned, dingy and blackish. The above, which is taken from Dr. Greville, is a very exact description of the plant as I have found it. On oak, Eastham. Rainhill.

13 S. AVELLANUM. Fries.

Coriaceous, hard, broadly effused; reflexed disc, narrow, villous, chestnut brown; hymenium pruinose or glabrous, colour of a ripe hazel-nut, more or less blood-stained when bruised. On stumps, Tarbock, &c.

14 S. RUFUM. Pers.

Cartilaginous, roundish, or confluent and oblong, almost entirely resupinate; purplish grey from the bloom which covers the tuberculated, rufescent hymenium. On the wood of fallen branches. Halsnead. Eastham.

Sub-genus RESUPINATUS.

15 S. FULIGINOSUM. Fries.

Coriaceous, effused, somewhat orbicular; hymenium dusky chesnut brown, uneven, smooth, closely beset with short erect spines, exactly as in Dr. Greville's plate of *Thelephora padi;* margin uneven, pale. Not, as far as I am aware, hitherto recorded as a British species. On a stake from the bottom of a hedge, Rainhill, Nov. 1856.

Genus XXIX. CORTICIUM. Fries.

Sub-genus HIMANTIA.

Mycelium and margin white.

16 C. GIGANTEUM. Fries.

Broadly effused, when moist watery white, when dry paper like, milk white, smooth, margin radiato-strigose. On logs of Scotch fir. Rainhill.

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17 C. LÆVE. Pers.

Effused, membranaceous; under side villous; circumference byssoid, but not distinctly radiating; hymenium smooth, bare, pale. Named for me by the Rev. M. J. Berkeley. On decaying wood not uncommon.

Mycelium and circumference coloured.

18 C. SANGUINEUM. Fries Ep.

Thelephora aurantiaca, E.F. Effused, circumference fibrillose; hymenophore loosely adhering to the matrix, which it deeply stains with its own orange crimson colour. On the wood of a fallen branch, Knowsley.

19 C. CŒRULEUM. Schrad.

Effused, sub-orbicular or confluent, sub-tomentose; bright indigo-blue, circumference byssoid pale. On fallen branches and sticks, Knowsley. Hangsdales Wood, &c.

Sub-genus LEIOSTROMA.

Definitely inferior, uniform, produced by a white mycelium which soon disappears.

20 C. CALCEUM. Fries.

Effused, wax-like, closely adhering to the matrix; hymenium and circumference alike, smooth whitish, much cracked when dry.

From wax-like becoming rigid, circumference at first slightly radiato-floccose, of the same colour as the hymenium, soon quite bare.

21 C. QUERCINUM. Pers.

Between waxy and membranaceous; agglutinated; circumference at length free and narrowly involute; underside blackish; hymenium flesh coloured. On fallen branches of oak, Knowsley.

22 C. CINEREUM. Pers.

Wax-like, agglutinated, lurid or dusky, pruinose. Firmer, more membranaceous, more easily separated from the matrix, and less cracked than *Tremella viscosa*. On logs and fallen branches.

23 C. INCARNATUM. Fries.

Effused, membranaceous, rigid, agglutinated, bright flesh-colour; margin narrow, pale. This is the description of a plant which I believe to be of the above-named species, but which I have never found except in a barren state. It is not uncommon, especially on dead stems of Ulex Europæus.

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24 C. SAMBUCI. Pers.

Effused, thin, white, spreading irregularly. On elder trees, Patrick-wood. Crosby, &c.

Genus XXX. CYPHELLA. Fries.

25 C GOLDBACHII. Weinm.

Pileus lobed; hymenium smooth; stem curved, covered with white down. Plant about 2 lines high, buff yellow. No. 720 in the Annals. On the small stem of some dried herbaceous plant. Botanic Gardens, Liverpool. Found by T. Shillitoe.

FAM. V. *CLAVAREI.* Fries.

Genus XXXI. CLAVARIA. Vaill.

Sub-genus RAMARIA.

Branched. Spores white.

1 C. FASTIGIATA. L.

1—2½ high. Tufted, firm, very much branched at the summit; branches short, like the spray of an oak; dull, luteous. *C. pratensis.*—E.F. Pastures, in short grass.

2 C. MUSCOIDES. L.

1—3 high. Solitary; moderately firm, forked; axils lunulate; stem attenuated below; bright egg yellow. *C. corniculata*—E.F. Amongst grass, Woolton. Knowsley.

3 C. CINEREA. Bull.

2—4 high. Brittle, sub-rugose, grey, pruinose; stem short; branches numerous, curved, terminating in crowded branchlets. Croxteth Wood.

4 C. CRISTATA. Holmsk.

1—2 high. Tufted, whitish, firm; branches dilated above, crested; laciniæ acute. Under willows near Huyton quarry.

5 C. RUGOSA. Bull.

1—3 high. Gregarious, nearly simple, tough, thickened upwards, roughish. Often with a few short subtruncated branches. Under trees, Rainhill. Patrick-wood. Halsnead, &c.

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Sub-genus SYNCORYNE.

Simple, but fasciculate and sub-united at the base.

6 C. FUSIFORMIS. Fries.

2—3 high. Cæspitose, even, lanceolate, attenuated, forming a dense tuft, luteous, darker at the apex. Bebbington. Knowsley.

7 C. INÆQUALIS. Fries.

1—3 high. Sub-fasciculate, of irregular growth, compressed or channelled, sometimes slightly forked. Whitish or pale yellow. Pasture near St. Helens. Not uncommon.

8 C. FRAGILIS. Holmsk.

Loosely tufted, very brittle, white or crumb of bread colour; club more or less obtuse and hollow.

VAR. A.—Turgid upwards, answering to Sow. t. 90; occurs growing gregariously, never tufted, in various woods in the neighbourhood.

VAR. C.—More slender and acute; answering to the longer figures in Bolt. t. iii. Occurs yearly on a grassy bank in Hangsdale's Wood. Intermediate forms are common.

Genus XXXII. CALOCERA. Fries.

9 C. VISCOSA. Pers.

1—1½ high, exclusive of the root. Rooting, smooth; branches linear, dichotomous; apices forked, acute; bright reddish gold colour. The substance is composed of narrowly clavate vesicles, containing globules of colouring matter; mixed with these are long, even, transparent threads. Spores sub-legumeniform. ·00045. Pale ochraceous. On a decayed fir-tree, Woolton Wood, 1857.

10 C. CORNEA. Batsch.

½ high. Rooting, three or four simple branches springing from the base; bright orange. Common, growing in the cracks of squared timber.

11 C. GLOSSOIDES. Fries.

½—¾ high. Simple, not united at the base; stem terete; club somewhat incrassated and obtuse; sub-tremellose; golden-coloured. On the trunks of oaks from which the bark has been stripped. Knowsley.

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12 C. TUBEROSA. Sow.

1—1½ high. Simple, sub-attenuated, luteous, two or more stems rising from a strigose, tubercular base. Bursting through the bark of a dead branch. Croxteth Wood.

Genus XXXIII. TYPHULA. Fries.

13 T. PHACORIZA. Reichard.

2—4 high. Simple, smooth, greyish brown; hymenium cylindrical. Abundant in woods at Halsnead and Croxteth, growing like long bristles from under dead leaves; mostly on a Sclerotium, resembling a flattened pea.

FAM. VI. *TREMELLINÆ.* Fries.

Genus XXXIV. TREMELLA. Persoon.

1 T. FOLIACEA. Pers,

2—3 broad. 1—1½ high. Substance between cartilaginous and gelatinous. Densely tufted; lobes thin, diaphanous, folded at the base, flesh-coloured, with a tinge of cinnamon, On a stump, Eastham Wood. Found by Mr. F. P. Marratt.

2 T. MESENTERICA. Retz.

Spores small, round. Substance at length soft, gelatinous; very variable in size and shape, often forming masses the size of a walnut; surface gyroso-plicate, golden-coloured. On decayed trunks and branches of trees. On the stems of Ulex Europæus occurs a plant, which, in the E.F., is referred to this species. I have, therefore, not ventured to give it another name, though its firmer substance, sub-cæspitose habit of growth, distinct compressed lobes, and full bright orange colour, seem to indicate, at least, an affinity with *T. aurantia*. Schwein.

3 T. ALBIDA. Smith.

Spores narrow, curved; substance very tender, transparent, nearly colourless, often in clusters the size of a filbert, surface slightly and bluntly gyroso-plicate. Common on decayed sticks in damp places.

4 T. SARCOIDES. With.

Growth at first in little distinct club-shaped bodies, which at length are compressed, and finally unite, forming a somewhat gyroso-plicate mass, sometimes attaining the size of a penny: ¼—⅜ of an inch in depth. Purple-flesh-colour Very common on timber, &c.

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5 T. VISCOSA. Pers.

Effused, of a soft waxy consistence, closely adhering to the matrix; when thin, diaphanous; circumference slightly radiating; hymenium sub-viscid, smooth, cracked when dry; varying from pale livid to dark dusky purplish in the same specimen. I find in my notes that this plant, when submitted to a succession of changes from dryness to moisture, seems to produce two or more super-imposed layers of hymenium. Not uncommon on fallen branches. This was written of Corticium viscosum, before I had seen the Rev. M. J. Berkeley's notes on the species, in accordance with which I have removed it to the genus Tremella. See the series in the Annals, No. 727.

Genus XXXV. EXIDIA. Fries.

5 E. AURICULA JUDÆ, L.

1—3 broad. Spores oblong, curved. ·00085. Concave, thin, flexuous; within, nearly smooth, wax-like, with folds towards the centre like those of the human ear, soon becoming black; without, tomentose, dusky brown. On elder trees. Tranmere. New Brighton. A variety occurs on willow posts, near New Brighton, of a fine umber colour; in the younger specimens the cup is quite entire and sub-stipitate; within, pale brownish, grey; without, brownish olive; growing profusely, and in one specimen attaining a breadth of five inches. This, notwithstanding its colour, shape when young, and habit of growth on willow, can hardly prove to be E. recisa, for the under side is not punctato-scabrous, nor is it in fact distinguishable from the under side of *E. Auricula Judæ*.

6 E. GLANDULOSA. Bull. ? *Witches' Butter.*

A most curious and abnormal variety of this plant, if indeed it be this plant, grows on old whitethorn trees, Knowsley. Effused, thick, substance between gelatinous and soft cheesy; an inch in depth, 3 or 4 inches wide, 8 inches or a foot in length; at first cream-coloured, opaque, soon darker, at length porous, friable, and quite black. The substance does not appear firm enough to assume a regular shape; it forms, however, irregular cavities, the concave surface of which is papillose and fertile. The spores are stoutly elliptic, not curved, nucleated, 00045 in length, mixed with innumerable sterigmata. The plant is not altogether fertile, but fertile portions are found mixed up with the stroma, as if they had been overgrown by the rapid exudacious increase of the plant.

Genus XXXVI. NÆMATELIA. Fries.

7 N. ENCEPHALA. Willd.

Substance cheese-like, becoming hard, roughly tuberculiform and plicate; yellowish flesh-colour, at length brown. Nucleus large, white. On larch rails, Bidston and Stourton.

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8 N. RUBIFORMIS. Weinm.

Small, round, surface beautifully gyroso-plicate. Reddish orange. Not hitherto recorded as British. Identified by the Rev. A. Bloxam. On a fallen branch in a very damp place, near Pex Hill.

Genus XXXVII. DACRYMYCES. Nees.

9 D. STILLATUS. Nees.

The size of hemp-seed, but often confluent; orange red. Spores small, round, filaments blunt. On almost every decaying rail.

10 D. MORIFORMIS. Smith.

The size of a pea, surface gyroso-plicate. Black. On a fallen branch, Bold.

Genus XXXVIII. CORYNE. Nees.

11 C. TURBINATA. Schum.

$\frac{1}{8}$—$\frac{1}{4}$ high. Disc a line broad. Stem simple, dilated towards the apex, brownish; hymenium clay-coloured. Spores very minute. On the wood of fallen branches, not uncommon during the winter.

HENRY GREENWOOD, 32, CASTLE STREET, LIVERPOOL.

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PROCEEDINGS

OF THE

LITERARY AND PHILOSOPHICAL SOCIETY

OF

LIVERPOOL,

DURING THE

FORTY-EIGHTH SESSION, 1858-59.

No. XIII.

LIVERPOOL:
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BY HENRY GREENWOOD, 32, CASTLE STREET.

1859.

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CONTENTS.

PAGE

List of Members ..... v.
Balance Sheet ..... xv.
Annual Meeting — Report 1
First Ordinary Meeting 4
Second Ordinary Meeting 5
Horrocks the Astronomer 5
Additions to Flora 6, 8
Additions to Fauna 10, 11
Mr. Brooke — "On Margaret of Anjou" 13
"On Castle of Fotheringay" 52
Third Ordinary Meeting 66
Mr. Haram — "On the Chameleon" 66
Mr. Archer — "On the Umbelliferæ" 79
Fourth Ordinary Meeting 122
Mr. Samuelson — "On Bone Manure" 122
Fifth Ordinary Meeting 123
Mr. Brooke — "On the Migration of Swallows" 123
Mr. Jesse's Letters 125, 127
Dr. Collingwood — "On Migration of Birds" 128
Sixth Ordinary Meeting 151
Dr. Edwards — "On Correlation of Physical Force," 152
Seventh Ordinary Meeting 167
Rev. H. H. Higgins — "On Gasteromycetes" 167
Eighth Ordinary Meeting 167
Mr. Elliot — "On Local Temperatures in Great Britain" 168
Ninth Ordinary Meeting 190
Mr. Keith — "On Photography" 190

Digitized by Google

PAGE

TENTH ORDINARY MEETING 191

Dr. Collingwood — "On the Astronomy of the Chaldæans" 192

ELEVENTH ORDINARY MEETING 227

Dr. Edwards — "On Marine Animals of the Mersey Shore" 229

TWELFTH ORDINARY MEETING 237

Epitaph to Horrocks 237

Mr. Archer — "On Mammalian Animals — Man" 238

THIRTEENTH ORDINARY MEETING 246

Rev. H. H. Higgins — "On Jania and Corallina" ... 247

DONATIONS 249

APPENDIX — Local Fungi .....

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May 4, 1857 Burton, Rev. Charles Henry, M.A. *Sandon-terrace.*

*May 1, 1848 Byerley, Isaac, F.L.S., F.R.C.S.E., Professor of Animal Physiology, *Queen's College; Myrtle Cottage, Victoria-road, Seacombe.*

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Nov. 16, 1857 Cooper, Joseph, *Oak House, Aigburth.*

May 31, 1858 Collingwood, Cuthbert, M.A. Oxon., M.B., L.R.C.P., F.L.S., Lect. on Botany, *Liv. Roy. Infirmary Sch. of Med.*, 46, *Nelson-street.*

Jan. 22, 1850 Cox, Henry, 15, *Exchange-alley N., and Poplar-rd., Oxton*

Jan. 12, 1857 Cranbrook, Rev. James, Professor of English Literature, *Queen's College*, and Hon. Lect. on Literature, *Liverp. Soc. of Fine Arts; Liscard.*

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Oct. 21, 1844 Dale, Robert Norris, *Exchange-st. E., and Childwall Abbey.*

*April 6, 1840 Dickinson, Joseph, M.A., M.D. Dub. and Cantab., L.R.C.P., F.R.S., M.R.I.A., F.L.S., Phys. to Liverp. Royal Infirmary, 92, *Bedford-street South.*

Nov. 27, 1848 Dove, Percy Matthew, F.S.S., 1, *North John-street, and* 49, *Hamilton-square, Birkenhead.*

Jan. 23, 1848 Drysdale, John James, M.D. Edin., L.R.C.S.E., 44, *Rodney-street.*

Feb. 4, 1856 Duckworth, Henry, F.G.S., 2, *Gambier-terrace, Hope-st.*

May 17, 1858 Duckworth, Dyce, 2, *Gambier-terrace, Hope-street.*

Jan. 9, 1837 Duncan, William Henry, M.D. Edin., Medical Officer of Health, 2, *Cornwallis-street, and* 17, *Peel-terrace, Upper Canning-street.*

May 3, 1833 Eden, Thomas, M.R.C.S.E., 6, *Riversdale-road, Aigburth.*

*Nov. 27, 1848 Edwards, John Baker, Ph.D. Gies., F.C.S., Lect. on Chemistry, *Liverp. Sch. of Med.*, 46, *Nelson-street.*

Nov. 16, 1857 Elliot, James, Professor of Mathematics, *Queen's College, Liverpool.*

Oct. 21, 1844 Ellison, King, F.R.C.S.E., 30, *Rodney-street.*

Dec. 15, 1856 England, Rev. James, M.A., 162, *Grove-street.*

Nov. 18, 1850 Evans, Henry Sugden, F.C.S., 52, *Hanover-street, and* 94, *Huskisson-street.*

*Dec. 14, 1846 Faram, John, 8, *Railway Cottages, Edge-hill.*

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Feb. 6, 1854 Fletcher, Fred. Dicker, M.R.C.S.E., Lect. on Anat. and Phys., *Liverp. Sch. of Med.*, 15, *Upper Duke-street.*

*Mar. 19, 1855 Foard, James Thomas, *Rodney-street, and* 34, *Church-st.*

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March 3, 1856 Grainger, John, B.A., 4, *Chapel-street, and Palatine Club, Bold-street.*

Nov. 14, 1853 Greenwood, Henry, 32, *Castle-street, and Roseville, Huyton-park, Huyton.*

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Dec. 16, 1850 Hamilton, George, F.R.A.S., F.C.S., Prof. of Chemistry, *Queen's College; Blackburne House, and Walton View, Egremont.*

Oct. 18, 1858 Hamilton, Robert Gordon, 12, *Tithebarn-street, and Rainhill.*

*Jan. 21, 1856 Hardman, Lawrence, *Sweeting-street, and Rock-park, Rock Ferry.*

Nov. 14, 1837 Hartley, John Bernard, *Coburg Dock, and* 10, *Bedford-street South.*

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Dec. 12, 1855 Hess, Ralph, 15, *South John-street, and Upper Duke-st.*

Dec. 28, 1846 Higgins, Rev. H. H., M.A. Cantab., F.C.P.S., *Rainhill.*

*Oct. 31, 1836 Higginson, Alfred, M.R.C.S.E., Hon. Lect. on Anatomy, *Liverp. Soc. of Fine Arts,* Surgeon to Southern Hospital, 44, *Upper Parliament-street.*

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Nov. 13, 1854 Hunter, John, Memb. Hist. Soc. of Pennsylvania.

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Jan. 26, 1857 Hutton, David, 3, *St. George's Crescent, and* 81, *Everton-road.*

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Feb. 23, 1857 Imlach, Henry, M.D. Edin., 3, *Bedford-street N.*

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*April 4, 1852 Jones, Morris Charles, 3, *Harrington-street, and* 75, *Shaw-street.*

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Oct. 21, 1844 Lear, John, 1, *North John-street, and* 22, *Holland-terrace, Duke-street, Edge-hill.*

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April 16, 1849 Moss, Rev. John James, B.A., *Upton, Cheshire.*

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April 3, 1854 Mott, Charles Grey, 27, *Argyle-street, Birkenhead, and Higher Tranmere.*

Jan. 26, 1857 Neoroji, Dadabhai, *London University.*

Oct. 20, 1856, Nevins, John Birbeck, M.D. Lond., M.R.C.S.E., Lect. on Materia Medica, *Liv.-Sch. of Med.*, 25, *Oxford-street.*

Dec. 15, 1851 Newlands, James, Borough Engineer, 2, *Cornwallis-street, and* 2, *Clare-terrace, Duke-st. N., Edge-hill.*

*Nov. 29, 1847 Nisbet, William, L.Fac.P.S.G., 18, *Church-st., Egremont.*

*Oct. 15, 1855 North, Alfred.

Dec. 28, 1846 Picton, James Allanson, F.S.A., 20, *Clayton-square, and Sandy-knowe, Wavertree.*

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Jan. 8, 1850 Ramsay, Rev. Arthur, M.A. Trin. Coll. Cantab., *Highfield, West Derby.*

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Feb. 6, 1854 Rees, William, 179, *Upper Parliament-street.*

Dec. 15, 1856 Retslag, Carl, Ph.D. Berlin.

Mar. 20, 1854 Rigge, Thomas, 64, *Rodney-street.*

Nov. 2, 1840 Robberds, Rev. John, B.A., 10, *High Park-street.*

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April 18, 1853 Rowe, James, 2, *Chapel-walks, and* 51, *Shaw-street.*

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Oct. 18, 1858 Stuart, Richard, *Fort-terrace, Bootle.*

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Jan. 23, 1843 Taylor, Robert Hibbert, M.D.Edin., L.R.C.S., F.B.S.E., Lect. on Opthalmic Medicine, *Liverpool School of Medicine*, 1, *Percy-street.*

Dec. 11, 1854 Thompson, Samuel Henry, Esq., *Thingwall Hall, Knotty Ash.*

Dec. 10, 1849 Thomson, David Purdie, M.D.Edin., L.R.C.S.E., 11, *Nelson-street, Great George-square.*

Nov, 17, 1856 Tinling Charles, 60, *Castle-st., and Clarence-st., Everton.*

Dec. 1, 1851 Towson, John Thos., Scient. Examiner, *Sailors' Home, and* 47, *Upper Parliament-street.*

*Feb 19, 1844 Turnbull, James, M.D.Edin., Phys. Liverpool Royal Infirmary, 19, *Upper Duke-street.*

Nov. 16, 1857 Tymbas, Gregory, 14, *Dale-street, and* 6, *Prospect-vale, Fairfield.*

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Oct. 21, 1844 Vose, James Richard White, M.D. Edin., Sen. Phys. Liverp. Royal Infirmary, 5, *Gambier-terrace.*

Oct. 21, 1844 Walmsley, Joshua, 50, *Lord-street.*

Oct. 18, 1858 Watkins, John W., M.D., *Newton-le-Willows, Bedale, near Warrington.*

Dec. 10, 1849 Watling, John William Henry, M.R.C.S.E., *Wavertree.*

May 18, 1857 Whitehead, James Wright, *Orange-court, Castle-street, and* 15, *Duke-street, Edge-hill.*

Oct. 15, 1855 Wilks, W. G., 1, *Dale-street, and Mill-bank, Anfield.*

CORRESPONDING MEMBERS.

LIMITED TO FIFTY.

Nov. 6, 1812 Peter Mark Roget, M.D. Edin., F.R.C.P., F.R.S., F.G.S. F.R.A.S., M.R.G.S., &c., *London.*

Feb. 2, 1815 George Cumming, M.D. Edin., L.R.C.P., *Denbigh.*

Feb. 12, 1819 John Stanley, M.D. Edin., *Whitehaven.*

Jan. 7, 1820 Joseph Carne, F.R.S., M.R.I.A., F.G.S., &c., *Penzance, Cornwall.*

Dec. 5, 1828 Rev. Brook Aspland, *Duckinfield, Cheshire.*

Jan. 4, 1833 The Right Hon. the Earl of Harrowby, P.C., D.C.L., F.R.S., *Sandon-hall, Staffordshire, and* 39, *Grosvenor-square, London.*

Jan. 4, 1833 James Yates, M.A., F.R.S., F.L.S., F.G.S., &c., *Lauderdale House, Highgate, London.*

April 12, 1833 Thomas Stewart Traill, M.D. Edin., F.R.C.P.E., F.R.S.E., F.G.S., &c., *Edinburgh University.*

Jan. 2, 1835 John Ashton Yates, M.R.G.S., *Bryanston-square, London.*

Jan. 2, 1835 George Patten, A.R.A., 21, *Queen's-road West, Regent-park, London.*

May 1, 1835 William Ewart, M.P., *Cambridge-square, Hyde-park, London.*

Nov. 2, 1835 The Right Hon. Lord Brougham and Vaux, M.A., F.R.S.

Oct. 17, 1836 Chevalier de Kirchoff, *Antwerp.*

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Feb. 20, 1837 The Right Hon. the Earl of Burlington, M.A., LL.D., F.R.S., M.R.I.A., F.G.S., M.R.G.S., F.C.P.S., F.Z.S., *Belgrave-square, London.*

Nov. 12, 1838 Professor Airy, M.A., D.C.L., F.R.S., Hon. F.R.S.E., Hon. M.R.I.A., F.R.A.S., F.C.P.S., &c., Astronomer, Royal, *Greenwich.*

Feb. 24, 1840 James Naysmith, *Patricroft.*

Nov. 2, 1840 Richard Duncan Mackintosh, L.R.C.P., *Exeter, Devonshire.*

Nov. 15, 1841 Charles Bryce, M.D. Glasg., Fell. F.P. and S. Glasg. Socio. dell'Accad. de Lin. Roma., *Ludlow.*

Oct. 21, 1844 J. Beete Jukes, M.A., F.R.S., M.R.I.A., F.G.S., Local Director of the Geological Survey of Ireland, *Dublin.*

Oct. 21, 1844 T. B. Hall, *London.*

Oct. 21, 1844 Peter Rylands, *Warrington.*

Oct. 21, 1844 John Scouler, M.D., LL.D., F.L.S., Prof. Nat. Hist. Dublin Royal Society, *Dublin.*

Oct. 21, 1844 Thomas Rymer Jones, F.R.S., F.Z.S., F.L.S., M.R.C.S.E. &c., *King's College, London.*

Oct. 21, 1844 Robert Patterson, *Belfast.*

Oct. 21, 1844 Signor L. Ballardi, *Turin.*

Oct. 21, 1844 Signor Michellotti, *Turin.*

Oct. 21, 1844 Thomas Bell Salter, M.D. Edin., M.R.C.S. Eng. and Edin., F.L.S., F.B.S.E., *Ryde, Isle of Wight.*

Oct. 21, 1844 Professor Alger, *Boston, U.S.*

Oct. 21, 1844 Sir Charles Lemon, Bart., M.A. Cantab., F.R.S., F.G.S., *Carclew, Cornwall.*

Oct. 21, 1844 Il Cavaliere Carlo Passerini, *Pisa.*

1844 William Carpenter, M.D. Edin., M.R.C.S.E., F.R.S., F.G.S., *London University.*

1846 Rev. Baden Powell, M.A. Oxon., F.R.S., F.R.A.S., F.G.S., &c., *Oxford University.*

1847 Sir William Rowan Hamilton, LL.D., Hon. F.R.S.E., M.R.I.A., F.R.A.S., F.C.P.S., Astronomer Royal of Ireland, *Dublin.*

Nov. 26, 1849 Thomas Nuttall, F.L.S., *Rainhill, Lancashire.*

Nov. 26, 1848 Rev. Thomas Corser, M.A., *Strand, Bury.*

Jan. 8, 1850 Rev. St. Vincent Beechy, M.A. Cantab., *Worsley, near Eccles.*

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Jan. 27, 1851 James Smith, F.R.SS.L. and E., F.G.S., &c., *Jordanhill, Glasgow.*

Feb. 24, 1851 Henry Clarke Pidgeon, *London.*

Feb. 24, 1851 Rev. Robert Bickersteth Mayor, M. A. Cantab., Fell. St. John's Coll. Cantab., F.C.P.S., *Rugby.*

Jan. 26, 1852 William Reynolds, M.D., *Coed-du, Denbighshire.*

Oct. 17, 1853 Rev. James Booth, LL.D., F.R.S., &c., *Wandsworth, Surrey.*

Feb. 23, 1857 Thomas Hutchinson, M.R.C.S., H.M. Con. *Fernando Po.*

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TREASURER'S ACCOUNTS, 1857-58.

Dr. *The Literary and Philosophical Society, in Account with* Isaac Byerley, *Treasurer, to October 18th, 1858.* Cr.

	£	s.	d.
To paid Greenwood — Printing "Proceedings"	37	16	2
,, Tinling — Printing and Reporting	18	14	6
,, Secretary's Expenses of Management: — Postages, and Delivery of Circulars, Letters, and Proceedings; Stationery and Envelopes; Parcels, Advertisements for Tenders for Printing, Excursion Guarantee, Clerical Expenses and Incidentals	19	18	7
,, Secretary — Editorial Expenses, voted by Council	10	10	0
,, Mrs. Johnson — Tea, Coffee, Candles, Attendance	11	9	10
,, Collector's Commission and Attendance	6	15	6
	£105	4	7
To Balance carried down	223	12	10½
	£328	17	5½

	£	s.	d.
By Balance from Last Account	200	15	5½
,, Subscriptions — Annual	110	5	0
Arrears	10	10	0
,, Entrance Fees	7	7	0
	£328	17	5½

October 18th, 1858, Errors Excepted,

Audited and found correct, Isaac Byerley, *Treasurer.*

Thomas Inman,
T. C. Archer, } Auditors.

Balance brought down —

	£	s.	d.
Dock Board	150	0	0
In hands of Treasurer	73	12	10½
	£223	12	10½

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THE LIVERPOOL

LITERARY AND PHILOSOPHICAL SOCIETY.

ANNUAL MEETING — FORTY-EIGHTH SESSION.

ROYAL INSTITUTION, October 18th, 1858.

THOMAS INMAN, ESQ., M.D., PRESIDENT, in the Chair.

The SECRETARY commenced the business of the evening by reading the following Report, which, on the motion of Mr. Higginson, seconded by Dr. Dickinson, was adopted:—

Since the Literary and Philosophical Society last assembled on an occasion such as this, the Forty-seventh Session has been completed; and the volume of "Proceedings," now in the hands of members, will speak so well for the business that the Council require to make no allusion to it further than this, that it sustains the reputation of this Society. The volume is somewhat larger than usual, and sooner issued. Pursuing the original intention of publishing separately the monographs on the local Natural History, the valuable contribution of the Rev. H. H. Higgins, M.A., on the Fungi, has been printed as an Appendix to the volume. The synopsis of British Hymenomycetes is taken from the "Epicrisis" of M. Fries, excepting where the arrangement in that work is superseded by the results of more recent

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investigations. The list which follows contains all the species described in the "English Flora," together with such as have from time to time appeared in the "Annals and Magazine of Natural History." It is believed that these pages will be found a useful contribution to British Botany. In the local flora, all the species of Hymenomycetes found near Liverpool have been described; and this is considered by the Council to be a most important addition to the Floras issued by the Society in former Appendices.

No local event has occurred in the interval of the Society's meetings of more importance than the meetings of the National Association for the Promotion of Social Science. A deputation from the Society attended on that occasion. The meetings of the British Association for the Advancement of Science were also attended by a deputation from this Society.

At the last Annual Meeting there were enrolled 196 Members. The number now stands thus —

Ordinary Members on the Roll at last Annual Meeting	153	
Ordinary Members elected since then ...	14	167
„ „ Dead.....	1	
„ „ Resigned	10	
„ „ Removed from Roll ..	4	15
Total Ordinary Members		152
Corresponding Members		43
Members of the Society at the present time.....		195

The Treasurer will report to you a favourable financial statement, and intimate that he has invested £150 in a Bond.

The Donations made to the Society have been laid before you, recorded in the minutes, and appear in the "Proceedings."

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A proposition will be made to you for slightly altering the period of the Society's meetings.

In conformity with the laws the retiring Council beg to nominate five members, viz. — Cuthbert Collingwood, M.B., Joseph Dickinson, M.D., Henry Duckworth, F.G.S., James Elliot, and Henry Sugden Evans, F.C.S.

(Signed) THOMAS INMAN, M.D., *President.*
DAVID P. THOMSON, M.D., *Hon. Sec.*

Royal Institution, October 18th, 1858.

The Treasurer's Accounts were then submitted and passed.

A ballot was then taken for the new Council, when the following were elected, the names being arranged according to votes and priority of enrolment, the last five being the nominees of the retiring Council —

The Rev. Henry H. Higgins, M.A., David Purdie Thomson, M.D., Isaac Byerley, F.R.C.S., F.L.S., John Baker Edwards, Ph.D., F.C.S., Joseph Carter Redish, T. Croxen Archer, Alfred Higginson, M.R.C.S., Richard Brooke, F.S.A., William Ihne, Ph.D., Henry Duckworth, F.G.S., Henry Sugden Evans, F.C.S., Joseph Dickinson, M.D., F.R.S., James Elliot, and Cuthbert Collingwood, M.B., F.L.S.

A ballot was then taken for the Officers, when the following were elected —

[DR. INMAN, PRESIDENT.]

Vice-Presidents:

The Rev. H. H. HIGGINS, M.A.
THOMAS C. ARCHER.
JOSEPH DICKINSON, M.D., F.R.S.

Treasurer:

ISAAC BYERLEY, F.R.C.S.

Hon. Secretary:

D. P. THOMSON, M.D.

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An alteration in the times of meeting of the Society was then submitted, and passed the first vote, to this effect —

First, that the stated Annual Meeting of the Council shall be held on the *last Monday in September*, instead of the first Monday in October. — Second, that the Annual Meeting of the Society shall be held on the evening of the *first Monday in October*, instead of the third Monday of that month. — Third, that the Ordinary Meetings shall be held on every alternate Monday following the Annual Meeting, until the end of April, with the exception of a Monday at Christmas: and that it be left to the judgment of the Council to carry any portion of this resolution into operation during the present session.

ORDINARY MEETING.

The Society having resolved itself into an ordinary meeting, Mr. John William Birschel, Curator of the Liverpool Botanic Gardens, was elected an ordinary member; and the resignations of the Rev. J. Herbert Jones, M.A., and William Saunders were accepted.

The SECRETARY exhibited a model, and explained an invention of Mr. William Rogers, of this town, whereby the approach to sand-banks would be indicated in the engine-room, or on board sailing vessels. He also drew attention to the modification of the Wessel gas-stove, whereby the shaft was surrounded by hot water, the inner ball being converted into the boiler.

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SECOND ORDINARY MEETING.

ROYAL INSTITUTION, November 1st, 1858.

DR. INMAN, PRESIDENT, in the Chair.

The SECRETARY communicated the success of the efforts of the Rev. R. Breckel, of Hoole, Preston, to erect a memorial to Jeremiah Horrocks, the Astronomer. A memorial window was to be placed in the church of which he was Curate, and certain stalls would be set apart, to be called "The Horrocks Sittings." A reprint of his works was also to be made. It was suggested that a tablet should be placed in St. George's Hall, for which voluntary contributions would be received by the reverend gentleman who had taken so much interest in this matter.

Mr. STUDLEY MARTIN called attention to a fact of which members in general might not be aware, that there was already a monument to Horrocks in St. Michael's Church, Toxteth Park, with the transit of Venus inscribed upon it.

The CHAIRMAN observed, that the subject was first brought before them by Dr. Booth, who, in his address to the Society, spoke of Horrocks as a man of whom Liverpool ought to be proud. It appeared that he lived but a very few years. He had no person in England at that time to assist him: all the books in his library he had procured from abroad; yet as a young man in an obscure position, he had worked out many astronomical problems. Kepler had estimated the transit of Venus, and, as it had turned out, incorrectly. It happened on a Sunday, and Horrocks had his astronomical instruments ready; but the time for church service came before the phenomenon took place, and Horrocks had to put on one side that work, to attend, as he said, to higher duties. When he came back from church he resumed his

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observations, till the afternoon service again called him away. As soon as that was over, he returned to his instruments, and then he saw Venus right on the sun. He was the first person to demonstrate the fact, having lived long before the time of Newton. Some of his books were printed in Germany: they had been long lost sight of, but a few of them were still extant, and had been recovered. Unfortunately, after his death, the house he had lived in was plundered during the civil wars, and his effects were scattered to the winds. He might be truly called the first English astronomer.

Dr. THOMSON submitted a tabular list of the Asteroids which had been discovered up to the present time, with particulars of their orbits, so far as ascertained, the names of their discoverers, and dates of first observation.

The following contributions to the local *Flora* and *Fauna* were then made —

First, by the Rev. H. H. HIGGINS, M.A., to the Flora —

SISYMBRIUM PANNONICUM. Jacq.

I had in my herbarium a specimen of this plant, gathered by myself in the same locality, in 1856, but I was unable to identify it. Mr. Babington, to whom Mr. Fisher sent the plant, mentions another instance of its occurrence in this country. It is an Hungarian plant, and has probably been introduced with seed corn. Crosby, near the railway; H. Fisher.

ROSA SABINI.

Abundant in a hedge at Liscard; H. Fisher.

ROSA CANINA, var. FOSTERI.

Walton; H. Fisher.

GERANIUM ROBERTIANUM, var. PURPUREUM.

Between Egremont and New Brighton; H. Fisher.

BARKHAUSIA SETOSA. D.C.

This is the Crepis setosa of the "English Botany." Hooker and Arnott do not consider it to be indigenous. Netherton; H. Fisher.

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POA PRATENSIS, var. SUBCÆRULEA.

Seacombe; H. Fisher.

LIMOSELLA AQUATICA.

Burscough mill-dam; T. Williams.

CHENOPODIUM HYBRIDUM.

Bath Farm, Ormskirk; T. Williams.

CALAMAGROSTIS LANCEOLATA.

Mr. Williams pointed this out to myself, as it was growing beautifully and abundantly in the Bath Wood. He remarks that the great length and toughness of the leaves seem to render it probable that it might be made useful as a fibrous plant. Bath Wood, Ormskirk; T. Williams.

ANACHARIS ALSINASTRUM.

Pit between the Botanic Garden and the Old Swan; T. Shillito.

SAGITTARIA SAGITTIFOLIA.

Probably introduced. Canal near Ellesmere Port; T. Shillito.

ACORUS CALAMUS.

Introduced. Canal near Ellesmere Port; T. Shillito.

POA NEMORALIS.

Mr. Wilson showed this plant to me, growing near Warrington. Hooton Park in a wood; T. Shillito.

ANTENNARIA DIOICA.

Sand-hills, Crosby; C. S. Gregson, T. Shillito.

UTRICULARIA INTERMEDIA.

Thornton Marsh; T. Shillito.

POTENTILLA ARGENTEA.

Bank of the Dee, near Parkgate, July, 1857; Rev. H. H. Higgins.

CARDUUS ACANTHOIDES.

Wood by the Weaver, July, 1857; Rev. H. H. Higgins.

CALAMINTHA ACINOS.

Near St. Helen's mortar works, September, 1858; Rev. H. H. Higgins.

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SCIRPUS TABERNÆMONTANI.

This appears to be the common species about Liverpool. I have not seen S. LACUSTRIS. Ditches, Crosby; Rev. H. H. Higgins.

SCIRPUS PAUCIFLORUS.

Certainly at present far more frequent than SCIRPUS ACICULARIS of the "English Botany," which I have never seen near Liverpool. Crosby; Rev. H. H. Higgins.

CAREX ELONGATA.

Dungeon Marsh, Hale; Rev. H. H. Higgins.

CAREX STRIGOSA.

Mill Wood, Hale; Rev. H. H. Higgins.

CAREX PUNCTATA.

Bidston Heath, scarce; Rev. H. H. Higgins.

Second, by Mr. MARRAT, to the Flora —

WEISSIA *verticillata*.

In a cave at New Brighton; Rev. H. H. Higgins. Eastham; F. P. Marrat.

DICRANUM *majus*.

Bromborough Wood; F. P. Marrat. Fruiting in October; Eastham Wood.

CAMPYLOPUS *densus*.

On old stumps in a wood at Woolton. Fruiting in October; F. P. Marrat.

POTTIA *cavifolia*.

In the road where the new Roman Catholic Chapel is built near Poolton; F. P. Marrat. Fruiting in February.

TRICHOSTOMUM *mutabile*.

Hilbre Island, betwixt tide marks; F. P. Marrat. Rare.

TORTULA *vinealis*.

Southport; F. P. Marrat. On a stone in the old road from Rock Ferry to Storeton.

TORTULA *Hornschuchiana*.

The plant considered to be of this species was gathered in Smithdown Lane and lost in the attempt to cultivate it.

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TORTULA *latifolia*.

Bromborough Wood, near the stream; F. P. Marrat and H. Fisher.

TORTULA *lævipila*.

On a tree between Bromborough Station and Clatterbridge; F. P. Marrat. On a tree in the Woodchurch Road.

HADWIGIA *ciliata*.

On the flat surface of a stone wall on the old road from Rock Ferry to Storeton. Again near Storeton; F. P. Marrat.

ORTHOTRICHUM *pumilum*.

On the low garden wall at the back of Mr. Hargreaves' premises Southport. Very rare. F. P. Marrat.

ORTHOTRICHUM *leiocarpum*.

On oak and willow trees. Not very rare. F. P. Marrat.

ORTHOTRICHUM *pulchellum*.

Bromborough and other woods; F. P. Marrat.

ORTHOTRICHUM *Lyellii*.

Bromborough Wood; F. P. Marrat and H. Fisher.

ORTHOTRICHUM *Sprucei*.

On a willow near the stream, Bromborough Wood. Rev. H. H. Higgins, F. P. Marrat, and H. Fisher.

ZYGODON *conoideus*.

Bromborough Wood. Very Rare. F. P. Marrat.

ZYGODON *viridissimum*.

At the roots of damp trees near streams; F. P. Marrat.

BRYUM *formosum*.

Wilson and Marrat. (New Species). Differs from all known Brya in its cucullate and even deflexed leaves. Southport, May 31st, 1857. F. P. Marrat.

BRYUM *uliginosum*.

In the drains on the coast; F. P. Marrat.

FISSIDENS *tamarindifolius*.

A single specimen gathered at Gillbrook; F. P. Marrat.

LEUCODON *sciuroides*.

On a tree in Bromborough Wood; Rev. H. H. Higgins, F. P. Marrat, and H. Fisher. Rare.

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HYPNUM *glareosum*.

On a bank at Poolton; F. P. Marrat. Rare.

HYPNUM *irriguum*.

In the stream, Bromborough Wood. Fruiting in April and May; F. P. Marrat.

HYPNUM *heteropterum*.

Under shelving rocks, Patrick Wood; F. P. Marrat.

HYPNUM *palustre*.

Carr Mill Dam; F. P. Marrat.

HYPNUM *stramineum*.

Among sphagna, Simons Wood Moss; F. P. Marrat.

HYPNUM *aduncum*.

Near Southport; William Wilson, Esq. New to Great Britain.

HYPNUM *sylvaticum*.

Warbrick Moor and Patrick Wood; F. P. Marrat.

NECKERA *pumila*.

On a tree overhanging a pond at Burton, Cheshire. Very rare. F. P. Marrat.

CRYPHÆA *heteromalla*.

On a tree, Bromborough Wood; F. P. Marrat. Very Rare.

Third, by CUTHBERT COLLINGWOOD, Esq., M.B., to the Fauna —

The following localities may be added to those of the less common Birds in Mr. Byerley's "Fauna."

REDSTART. Phœnicura ruticilla.

Botanic Garden and Eastham.

LESSER WHITETHROAT. Curruca sylviella.

Storeton and Rock Ferry.

GARDEN WARBLER or PETTYCHAPS. Curruca hortensis.

Met with two near the keeper's house, in Hooton Wood, in June. N.B.—This bird, one of the most beautiful of our songsters, and only surpassed by the Nightingale, is new to the Fauna.

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Wood Warbler. Sylvia sylvicola.

Repeatedly met with, *e.g.*, Twice at Eastham, Birkenhead Park, Hooton Wood, Bidston Hill.

Chiff-chaff. Sylvia hippolais.

Bromborough.

Bunting. Emberiza miliaria.

Tolerably common during the summer. Tranmere, Wallasey, New Brighton, &c.

Cuckoo. Cuculus canorus.

In no part of the country have I met with this bird so abundantly as upon the Sand-hills, near Liverpool.

Jay. Garrulus glandarius

Not unfrequently met with in Wirral, Bidston Hill, Eastham, &c.

Razor-Bill. Alca torda.

Picked up a dead one on the shore at Formby.

Fourth, by Dr. Collingwood and Dr. Edwards, to the Fauna—

Doris tuberculata.

Several large ones on the Egremont shore, near the slip, in August; Monks' Ferry.

Doris Johnstoni.

Monks' Ferry, August 12th. (J. B. E.)

Tritonia Hombergii.

Hilbre, May 15th. (C. C.)

Dendronotus arborescens.

In profusion on the Pontoons of the Landing Stage, in August, where we collected forty in a quarter of an hour. Dingle.

Doto coronata.

A minute but common species. Landing Stage, upon the Tubularia; Monks' Ferry; Egremont.

Eolis papillosa.

Landing Stage, August. Dingle.

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EOLIS CORONATA.

Certainly the most common Eolis during the past summer. Monks' Ferry, Egremont, Landing Stage.

EOLIS DRUMMONDI.

Egremont and Monks' Ferry. Not so common as the last.

EOLIS AURANTIACA.

Landing Stage, in company with Dendronotus and Doto. Most of the specimens in this locality were difficult to recognise either from the plate or the description in Alder and Hancock's work, the principal difficulty being that they had no trace of orange colour about them. Dr. C. forwarded specimens to Mr. Alder, who returned answer — "I think it is most likely a variety of *E. aurantiaca*, which varies more in colour than we were aware of when we gave it the name."

AMPHITRITE VENTILABRUM.

This is the beautiful Annelid erroneously called *A. auricoma*.

SYLLIS NOCTILUCA.

A luminous Annelid, found in the mud between the mussels on the Landing Stage. It is new to the Fauna. (J. B. E.)

RHIZOSTOMA PULMO.

Not uncommon along the New Brighton shore, in October. (C. C.)

OPHIOCOMA ROSULA.

This very variable species of Brittle Star may be found in great variety of colour and general aspect under stones along the Egremont shore.

SERTULARIA PUMILA.

Abundant on all the Fucus serratus which covers the Monks' Ferry slip, and the sea-wall between Birkenhead and Seacombe, &c.

ACTINIA (Actinoloba) DIANTHUS.

Abundant on Monks' Ferry slip, both white and buff varieties, and of all sizes. Very fine white specimens from New Brighton, and sparingly upon most parts of the coast.

ACTINIA CORIACEA.

This appears to be the Tealia crassicornis of Gosse.

CELLULARIA (Bugula) AVICULARIA. Corkscrew coralline.

Met with in most parts of the coast, especially Egremont and Monks' Ferry.

The following paper was then read —

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ON THE LIFE AND CHARACTER OF MARGARET OF ANJOU, THE QUEEN OF KING HENRY VI.

By RICHARD BROOKE, Esq., F.S.A.

King Louis — "Yield not thy neck
To fortune's yoke, but let thy dauntless mind
Still ride in triumph over all mischance.
Be plain, Queen Margaret, and tell thy grief;
It shall be eas'd, if France can yield relief."

Queen Margaret — "Those gracious words revive my drooping thoughts,
And give my tongue-ty'd sorrows leave to speak.
Now, therefore, be it known to noble Louis,
That Henry, sole possesor of my love,
Is, of a King, become a banish'd man,
And forc'd to live in Scotland a forlorn;
While proud, ambitious Edward, Duke of York,
Usurps the regal title, and the seat
Of England's true anointed lawful King.
This is the cause that I, poor Margaret,
With this my son, Prince Edward, Henry's heir,
Am come to crave thy just and lawful aid.

Shakespeare's Henry VI. Part iii. Act 3.
Scene 3 — A Palace in France.

Upon the death of King Henry V., on the 31st of August, 1422,* his only son, King Henry VI., succeeded to the throne of England, when he was an infant, not nine months old, he having been born at Windsor in 1421. He was crowned at Westminster on the 6th of November, 1429, and at Notre Dame, at Paris, on the 17th of November, 1431.†

When Henry grew up to manhood, he was discovered (greatly to the disappointment of the English) to be very unfit for government. Unlike the others of the Royal House of Plantagenet, who were generally bold, talented,

* Ralph Brooke. Sandford, pp. 280-289.
† Ralph Brooke. Sandford.

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and enterprising, he was timid, quiet, and irresolute; his mind was so weak as nearly to amount to imbecility; he always gave himself up to the guidance of those about him; and he was occasionally subject to serious attacks of indisposition of mind or body, or both combined; but he was compassionate, virtuous, patient, temperate, and harmless; and he had not any particular pursuit or habit, except the observance of religious forms and duties. A King of such a character as has just been described, was never likely to be popular; but if the weakness of his understanding prevented his commanding the respect or admiration of his subjects, at least the harmlessness of his life insured him from their hatred.

Widely different from this, was the character of his Queen, Margaret of Anjou. She was bold, decisive, and daring, possessed a strong mind, great talents, and fascinating manners, besides which, she was accomplished, witty, and beautiful; but, as a set-off against these qualities, she was ambitious, proud, fond of power, vindictive, and unscrupulous. Margaret's favourite device was the Daisy; and she evinced good taste in the selection, for it was pleasing, and very appropriate to her name, the French word for the daisy being *marguerite*.

Margaret was the daughter of René, Duke of Anjou (the brother of Mary, Queen of Charles VII., King of France), and Isabel, his wife (third daughter of Charles, Duke of Lorraine), and who, in addition to his being Duke of Anjou, bore the pompous but empty titles of King of Sicily, Naples, and Jerusalem,* without possessing one acre of land in any of those kingdoms.

Although Margaret's family was scarcely of a rank sufficiently elevated to justify her in aspiring to a marriage with the King of England, yet her descent and

* Fabyan, Hall, Holinshed, Ralph Brooke, Grafton, Baker, Stow, Speed.

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the alliances of her family were of a high order. The armorial bearings of Margaret are interesting in that respect. Sandford, Lancaster Herald, mentions the circumstance of their being carved in stone over the entrance of Queen's College, Cambridge, of which she was the founder.* "Quarterly of six pieces, viz.:—1. Barry of 8 Argent, and Gules — Hungary. 2. Azure, semée of Flowers de Lys Or, a Label of 3 points, Gules — Naples. 3. Argent, a Cross crouche inter 4 Crosselets Or, Jerusalam. 4. Azure, semée of Flowers de Lys Or, a Border Gules—Anjou. 5. Azure semée of Crosse-Croslets fitche, and 2 Barbells adorsee Or, Barr; and 6. Or, on a Bend Gules 3 Eaglets, Argent — Lorrain."†

I was at Cambridge on the 21st of May, 1858, and visited Queen's College, and had no difficulty in finding the escutcheon, containing the armorial bearings of Margaret, alluded to by Sandford, which are carved on stone over the inner entrance of the College, and are still, as respects the blazonry, precisely as he has stated that they were at the time when he wrote, in the reign of Charles II.; but in consequence of the effects of time and weather, the tinctures, or in other words, the metals and colours‡ (with the exception of the gold, "Or"), are now rather faded. Although the armorial bearings have the appearance of considerable antiquity, yet, judging from the ornaments carved on each side of the escutcheon, the former seem to have been placed there long after the College was erected; but I can readily believe, that the escutcheon on which they are carved, is the identical one which existed in Sandford's time, and of which he has

* Sandford's *Genealogical History*, p. 291. Queen's College was founded by Queen Margaret in 1446, and enlarged or refounded, by Queen Elizabeth, the consort of Edward IV. in 1465.

† Sandford, p. 291. Sandford also mentions, that the same six quarterings are also impaled with those of King Henry, her husband (being quarterly France and England), in a Chancel Window of Ricot Chapel, in the County of Oxford.

‡ The tinctures are expressed upon the escutcheon by gilding and painting.

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correctly described the blazonry. Margaret's armorial bearings, precisely similar, also appear at the upper end of the Dining Hall of the College, under a pediment of carved wood; but they seem to be of a more modern date than the former, and the tinctures are perfect and clearly defined.

In 1444, after long and desolating wars between the English and French, in which the English had lost a great portion of the territories which they had previously held in France, both nations were strongly disposed to a peace or a truce. William de la Pole, Earl of Suffolk, and others, were accordingly sent from England to France, to treat with the Duke of Orleans and other delegates from the French King, Charles VII., and a truce was agreed on for a limited period.* The Earl of Suffolk appears, also, to have had other objects in view: he possessed great power at Henry's Court, and was desirous to preserve or increase it by the influence which a beautiful and talented woman, devoted to his interests, and considering herself in a great measure indebted to him for her high position as Queen of England, would naturally have over a feeble-minded King. The Earl accordingly, besides transacting the business of the truce, caused a marriage to be proposed between King Henry and Margaret of Anjou.

According to Suffolk's views, it was essential that the intended Queen should possess superior abilities, so as to counterpoise the mental defects of the King, and should be of such a resolute turn of mind, as to protect the ministers exercising the functions of the government.

* The authorities for the historical matters mentioned in this paper, and also in another by the same author, upon the Life of the Great Earl of Warwick, called the King Maker, read before the Literary and Philosophical Society of Liverpool, on the 2nd of November, 1857, are Fabyan, William of Worcester, Hall, Holinshed, Grafton, Philippe de Commines, Leland, Baker, Stow, Speed, Rapin, Rot. Parl., Sandford, and the Historie of the arrivall of Edward IV. in England, published for the Camden Society.

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It was also requisite, that her rank amongst the Princes and Courts of Europe should be such, as not to be a degradation to the King, and yet that she should, not as a matter of course, have a right to aspire to the rank of Queen of England; but that she should think herself indebted to those who might help her to it, and should consequently consider herself to some extent bound to support them; and he thought that he had met with all these requisites in Margaret of Anjou.

It has been suggested by some writers, that before Suffolk went over to effect the truce, he had received permission from the King to negotiate the marriage; but, be that as it may, he took care, on his return to England, to represent the merit, beauty, and accomplishments of Margaret, in so strong a light, and to point out that this Princess being niece to the Queen of France, and much favoured by King Charles VII., the marriage would be very instrumental in promoting a peace between the two countries; and Suffolk was accordingly created a Marquis, and sent over, in November, 1445, to conclude the affair of the marriage.

Suffolk was indiscreet or corrupt enough in settling the terms of the marriage, to consent, on Henry's behalf, to deliver up the Duchy of Anjou and the Province of Maine* to Margaret's uncle, Charles of Anjou, which was virtually giving them up to the King of France, as subsequent events proved.

Henry's marriage with Margaret was accordingly solemnized by proxy (Suffolk being proxy for Henry) with much pomp, at Tours, in the presence of King Charles, his Queen, the Dauphin, and a great number of the French nobility. Although the nuptials were celebrated in November, Margaret did not come to England until the following spring, when she was conducted by Suffolk,

* Hall, Holinshed, Stow, Speed.

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who embarked with her at Dieppe, and they landed at Portsmouth.*

On the 22nd of April, 1445, she was married to Henry, at Southwick, near Porchester, in Hampshire, and was crowned at Westminster on the 30th of May following.†

She possessed many requisites for becoming popular with the English, but she soon became unpopular. In a very short time, she perceived her husband's weakness of mind, and obtained an absolute ascendancy over him. A strict union was formed between her, Cardinal Beaufort, and the Marquis of Suffolk; and, aided by them, she arbitrarily ruled the kingdom in Henry's name.

One of our ancient chroniclers (Hall) quaintly states, that, "although she joyned her husbande with hir in name for a countenaunce, yet she did all, she saied all, and she bare the whole swynge, as the strong oxe doth when he is yoked in the plough with a pore silly asse; and firste of all she excluded the Duke of Gloucester from all rule and gouvernaunce."‡

Humphrey, Duke of Gloucester, was the uncle of the King, and was obnoxious to Margaret, the Cardinal, and Suffolk, in consequence of his being a continual obstacle to their measures and schemes, and having from the first offered great opposition to the King's marriage, because, amongst other reasons, Henry was at the time of the treaty for it, engaged to the daughter of John, Count of Armagnac; besides which, Gloucester was popular in consequence of his wisdom and abilities. Under these circumstances, he had much to fear from the enmity of the Cardinal, Suffolk, and their partisans, strengthened, as they were, by Margaret's authority; and they all looked upon Gloucester as their common

* Hall, Holinshed, Grafton.

† Ralph Brooke. Sandford's *Genealogical History*, p. 291.

‡ *Hall's Chronicles*, p. 151.

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enemy. Margaret adopted the views of Suffolk, loaded him with favours, followed his advice, and treated him as her confidant. It was an important point for them and the other enemies of Gloucester, to effect his destruction. He attended the opening of parliament at Bury St. Edmunds, on the 10th of February, 1446-7, and was arrested and imprisoned on the next day. On the 28th of February, seventeen days after his arrest, he was found dead in his bed, and violent suspicions were entertained that he had met with his death by strangulation, suffocation, or other foul means; and the Queen was generally suspected to have been cognisant of, or implicated in, the murder. In order to remove suspicion, his body was exposed for several days to view; but that did not remove the odium, which especially attached to Suffolk, from his being supposed to have been one of the contrivers of the murder, and to the Queen, from its being imagined that she had sanctioned it.

The partition of Gloucester's possessions, part of which was secured by the Queen for herself, and the greatest portion was granted to Suffolk and his partisans, served to increase the suspicions; and the secret articles of the treaty, as to the cession already mentioned of the English possessions abroad, transpiring soon afterwards, caused such an outcry to be raised against Suffolk, that he endeavoured to vindicate his conduct before Henry and some of the Council; and although he was exculpated by Letters Patent, that expedient did not satisfy the public, and a loud and general clamour still ran against him, and all national misfortunes were charged to his account.

Whether Gloucester died by violence or not, neither Suffolk nor any other person supposed to have been implicated in his death, long triumphed in the enjoyment of power or wealth. Cardinal Beaufort, who was suspected of being one of the contrivers of the murder,

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only enjoyed for about a month, the satisfaction of the death of his adversary, and is said to have expired in a conflict of disappointment and passion, complaining that his vast wealth was incapable of exempting him from the common fate of all mankind; and we shall very soon have occasion to notice the wretched termination of Suffolk's career.

It is worth while here to consider for a moment, how short-sighted are the views of mortals, and especially of the wicked. The Queen, Suffolk, and the rest of the adversaries of the Duke of Gloucester, flattered themselves that his death had placed them out of the reach of all formidable opposition. He was the son of Henry IV., brother of Henry V., and uncle of Henry VI., and was the heir presumptive to the throne, so long as the King had not any issue, and he was one of the most powerful supporters of the House of Lancaster. Whilst Gloucester lived, his talents, rank, and power served to curb and keep in check Margaret, Suffolk, and others; it therefore can scarcely excite surprise that they rejoiced at his death. But mark the retribution which followed: the Duke of Gloucester's death was the very cause of the destruction of Queen Margaret's power and happiness, and of the dethronement of her husband. As long as Gloucester lived, his power prevented any one of the House of York from bringing forward a claim to the Crown; but Gloucester being dead, then Richard Plantaganet, Duke of York, soon saw himself in a position to claim the throne of England, and to support that claim by force of arms; which occasioned the dreadful wars of York and Lancaster.

At the commencement of the year 1448, the King, who was entirely guided by the Queen, elevated Suffolk to the rank of Duke of Suffolk. It was a most unwise step, as it was almost like setting public opinion at defiance,

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to bestow honours, evidently by the Queen's influence, upon a nobleman so generally hated by the nation; and her unfortunate union with him, afforded her enemies the opportunity of making it a handle, to promulgate rumours and suggestions prejudicial to her reputation.

Hostilities recommenced between the English and French even before the truce expired, and the English lost nearly all their possessions in France. The disastrous wars in that country contributed to the unpopularity of Queen Margaret and Suffolk, and great clamour, dissatisfaction, and complaints, arose amongst the people, who were much irritated at seeing the administration of the public affairs in the hands of a foreigner. Henry, unfit for government, did little, except lend the sanction of his name to the Queen, who made what use she pleased of it; she caused such persons as she did not like to be removed from the Council, and men to be substituted for them, who were wholly devoted to her will. The King was much addicted to his devotions, in which she caused him to pass most of his time, as being unfit for any thing else, and in order to take him off from all thoughts about the government.

Whilst the nation was thus irritated, the necessities of the Crown compelled the ministers to call a parliament, which met on the 6th of November, 1449, and was eventually held by prorogation in the early part of 1450; and the Commons brought forward articles of impeachment for several offences, against the Duke of Suffolk, which they delivered to the Lords. After some dilatory proceedings, the King of his own motion and decision, and without reference to any advice of the Lords, or by way of judgment, thought fit to banish Suffolk from England for five years. Suffolk proceeded to the sea-side, and embarked at Ipswich. Before he had proceeded far on his voyage, his enemies, who appear to have arranged their measures

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beforehand, captured him, by means of a vessel called the Nicholas of the Tower, which belonged to Bristol; and the Captain caused him to be put into the boat, and there to be beheaded with a rusty sword,* on the 2nd of May, 1450. He also caused the Duke's body to be laid upon the sands of Dover, from whence it was removed and interred in the Collegiate Church of Wingfield, in Suffolk.†

By his death, the Duke of York, whose claim to the Crown of England has been already noticed, finding himself delivered from a potent adversary, who had always been strongly attached to the house of Lancaster, soon began cautiously and secretly to adopt measures, with a view to his own accession to the throne.

Edmund Beaufort, Duke of Somerset, succeeded Suffolk in the Queen's favour, and with her support, had the direction of the public affairs, and ruled the kingdom with absolute sway. He also was a firm and devoted supporter of the house of Lancaster.

In 1450 the insurrection of Jack Cade and the Kentish rebels broke out; and Fabyan informs us, that the King and Queen retired to Kenilworth during part of its continuance. The insurrection was quelled, but other events of a very serious nature soon occurred elsewhere.

The Duke of York, who had been for some time Lord Lieutenant of Ireland, returned to England after that insurrection, and found that attempts were made, by orders from the Queen's party, to oppose his landing, and that other objectionable and hostile measures had been resorted to against him; in consequence of which, and of the extreme jealousy with which Margaret regarded him,

* An account of his capture, and of his being beheaded, is to be found in Fenn's "Collection of Original Letters" (sometimes called "The Paston Letters"), vol. i. p. 41.

† The corpse lies interred under an altar tomb in the chancel, with his effigy in armour, gilt, carved in wood, upon it, well executed. The effigy of Alice, his wife, lies on his right hand.— Fenn's Collection of Original Letters, vol. i. p. 41 (note).

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it appeared to him, that he had nothing but force to rely upon, for his own safety. He had the powerful support of the Earl of Salisbury, the Earl of Warwick (afterwards called the King-maker), the Duke of Norfolk, and many other noblemen and knights; and early in 1452, they raised an army, giving out that their object was the removal of Somerset and other objectionable ministers, and to reform abuses. Another army was also raised on the part of the King; and the hostile forces found themselves encamped close to each other, at Brent Heath, near Dartford. A parley ensued, and the Duke of York undertook to disband his forces, provided the Duke of Somerset should be ordered into custody. The King took him at his word, and Somerset was accordingly taken into custody; in consequence of which, the Duke of York, on the 1st of March disbanded his army, and without taking any precautions for his own safety, went to Henry, and was much astonished, immediately afterwards, to see Somerset at liberty, in violation of the King's agreement.

At first the Duke of York was treated as a prisoner; but a rumour that his son, the Earl of March (afterwards King Edward IV.), and his friends were advancing with an army to his assistance, some important events which then occurred in France, which occupied the serious attention of the Government, and the disgrace which would attach to a violation of the King's word, were considerations sufficient to induce the Queen and Somerset to set him at liberty, although their personal interests and inclinations might have prompted them to sacrifice him.

The Duke was accordingly liberated, after taking an oath of allegiance to Henry, and withdrew to his castle of Wigmore, in Herefordshire. Hostilities were carried on between the English and French for sometime, but terminated in the irrecoverable loss by the former, of Guienne.

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On the 13th of October, 1453,* Margaret was delivered of a son, who was named Edward, and was, in 1454, created Prince of Wales and Earl of Chester.† The public generally, however, would not believe, or affected not to believe, that Henry was the father of the young prince.

Henry was attacked with a serious fit of illness in 1454, and was considered as a man out of his senses; and in consequence of his incapacity for Government, the Duke of York was eventually made Protector and Defender of the Realm, and Somerset was sent to the Tower.

About the commencement of 1455, the King's health became improved, and the authority and appointments of the Duke of York were revoked, and the Duke of Somerset was set at liberty, and reinstated in his former power.

The Duke of York soon raised an army, and advanced with the Earls of Salisbury and Warwick towards the King. Henry marched from Westminster on the 20th of May,‡ with an army of the Lancastrian party, lodged that night at Watford, and the next day came to St. Alban's.§

The Duke of York, with his forces, also marched to St. Alban's. On the 22nd‖ of May, 1455, the two armies encountered each other there. The King had with him Edmund Beaufort, Duke of Somerset; Humphrey Stafford, Duke of Buckingham; his son, Humphrey Stafford, Earl of Stafford; Henry Percy, Earl of Northumberland; James Boteler or Butler, Earl of Wiltshire; Jasper Tudor, Earl of Pembroke;¶ Thomas, Lord Clifford; Sir John Wenlock, afterwards Lord Wenlock, and many knights and gentlemen. According to the old historical writers, the King

* Fabyan. Sandford, p. 299. † Sandford.

‡ Hall and Grafton. On the 21st, according to Stow. On the 20th or 21st, according to Holinshed. § Stow, p. 398.

‖ Dugdale, vol. i. pp. 166, 342; and Sandford, p. 321; but the 23rd of May, according to Fabyan, Hall, Holinshed, and Grafton.

¶ Holinshed, Stow, Speed, Habington's "Life of Edward IV."

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planted his standard at a place then called Coselow, otherwise Sandiford, in St. Peter Street; and Lord Clifford defended the barriers of the town, to prevent the Duke of York from entering, whilst the latter assembled his forces at a place then called "Keiefield," or "Keyfield."* The Yorkists made an attack in three several places. The Earl of Warwick, with a body of men under his command, broke in through a garden;† and the part of the town where the Yorkists succeeded in first entering it, was about the middle of St. Peter Street;‡ and a fierce battle took place, which terminated in the complete defeat of the Lancastrians. Several of the leaders of that party lost their lives and many others were wounded; the Duke of Somerset, the Earl of Northumberland, the Earl of Stafford, and Lord Clifford were slain; the King was wounded in the neck by an arrow; the Duke of Buckingham, Lord Scales, and Sir John Wenlock were wounded, the two former in their faces; and altogether about 5600 men were slain, including the loss on both sides. The Earl of Wiltshire and Thomas Thorpe, Chief Baron of the Exchequer, saved themselves by flight.

I was at St. Alban's on the 14th of July, 1858, and visited the places where the battle was fought, and was much struck with the apparent accuracy of the ancient historical writers on the subject. St. Peter Street naturally still retains its name, and is one of the principal streets; and I found, without any difficulty, the part of the town called by Holinshed "Keiefield," and by Stow "Keyfield," which is sufficiently identified, independently of tradition, by a range of houses called Keyfield Terrace. It is on the south-eastward side of the town, and close to the old road to London; and it is remarkable, that from Keyfield Terrace to the middle of the back part of St. Peter

* Holinshed Stow, Habington's "Life of Edward IV."

† Stow. Speed. ‡ Holinshed.

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Street, where the Yorkists are stated to have succeeded in first breaking into the town, the space is even yet principally covered with gardens; which strongly corroborate Stow's and Speed's statements, that Warwick broke in through a garden. Stow also states, that he "brake in by the garden side into the said towne, betweene the signe of the Key and the Exchequer, in Holywell Street."

With this battle, the calamitous and sanguinary wars of York and Lancaster, called also the wars of the Roses,* commenced; and the history of the next twenty-two years presents to the reader a lamentable series of conflicts and bloodshed.

The King was captured after the battle, and conveyed by the victors to London; and the Duke of York, in the King's name, convened a Parliament, got himself made Protector of the Realm and of the King's person, and caused the Earl of Salisbury to be made Lord High Chancellor, and the Earl of Warwick to be Captain of Calais.

In the mean time, Margaret, greatly mortified and indignant at these proceedings, called a meeting of her partisans, at Greenwich, at which they conferred together upon the best plan for the restoration of the King to his former liberty and government; and eventually, upon his health becoming a little better, the Duke of York was discharged from his office of Protector, and the Earl of Salisbury was deprived of the office of Chancellor. The Duke of Buckingham and Henry Beaufort, Duke of Somerset (son of the late Duke), then became

* "As John of Gaunt, Duke of Lancaster, used a red rose for his devise, in right of his wife, Maud of Lancaster, so this Edmund, his brother [Edmund of Langley, Duke of York] took for his, a white one, which the fautors and followers of their heirs did afterwards bear for distinction in that bloody war between the families of Lancaster and York; long before which assumption, a white rose tree at Langleete did bear upon one branch a fair white rose on the one side, and as fair a red rose on the other, which might be interpreted to have been a foretoken of that division."—Sandford's Genealogical History, p. 357, referring to Camden's remains, p. 214.

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chief ministers, and governed with great power at Court, whilst York and Salisbury retired for a time from office and public life.

Margaret could not be easy whilst York lived. She knew that he could not be openly despatched, without great risk and difficulty, but there were other ways of getting rid of him. She was desirous to draw York, Salisbury, and Warwick to Coventry, whither she had taken the King, considering that those noblemen would not have the same protection there as in London; and she sent them letters, under the King's hand, requiring their presence at Coventry.* They proceeded accordingly towards that city, but received some intimation of the peril they would be in if they went hither, and they had not a moment to lose in effecting their escape, which they succeeded in doing, but not without danger. As the old historical writers appear to agree in their accounts of this transaction, it follows, that treachery formed a considerable feature in Margaret's character.

An insincere reconciliation ensued between the leaders of the rival factions, effected chiefly by means of the good offices of Thomas Bourchier, Archbishop of Canterbury. A solemn procession took place on the 25th of March, 1459,† to St. Paul's Church, at which York handed Queen Margaret, followed by Salisbury and Somerset, Warwick and Exeter,‡ one of each party walking abreast with the other, hand in hand.

This seeming reconciliation was soon interrupted. An affray took place between some of the King's servants

* Fabyan, Hall, Holinshed, Baker.

† At this time, the legal year, instead of commencing as now — on the 1st of January — commenced on the 25th of March, which probably may account for some of our old writers giving the date of the occurrence as in 1458.

‡ Henry Holland, Duke of Exeter. He married Anne, eldest daughter of the Duke of York, and sister of King Edward IV., but was always a consistent Lancastrian.

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and those of the Earl of Warwick; several were wounded, and the Earl escaped with considerable danger; and it gave rise to the suspicion, that a design had been formed to kill Warwick; and he, after communicating with York and Salisbury as to the measures requisite for their safety and for taking the field in case of necessity, hastened over to Calais, to make sure of his government there.

Margaret, in the meantime, was desirous to ingratiate herself with the nobility and gentry of Cheshire, and other parts. She knew how to lay aside her haughtiness, and to use her powers of pleasing, when it suited her purpose; and on this occasion she made herself popular, especially in Cheshire, and caused the young Prince to distribute his badges of silver swans to the gentry of that county and elsewhere.*

The Earl of Warwick arrived in England from Calais, with a considerable body of soldiers, in 1459. The Duke of York, considering that there was not any safety for him without force, was not idle, and proceeded to raise troops. Salisbury marched with an army from Middleham Castle, in Yorkshire, and took his way through Lancashire,† in order to join York and Warwick. Margaret having intelligence of this, gave orders to James Touchet, Lord Audley, to march with an army and intercept him. At this time Henry was at Coleshill, in Warwickshire, and Margaret and the Prince of Wales were at Eccleshall, in Staffordshire. ‡ A battle ensued at Blore Heath, near Market-Drayton, on the 23rd of September, 1459. Lord Audley was slain, and the Lancastrians were defeated.

The united forces of York, Salisbury, and Warwick, assembled at Ludford,§ close to the town of Ludlow; and the King's army was so near to them, that a

* Holinshed. Stow. † Baker.

‡ Rot. Parl., 38 Henry VI. (1459), vol. v. p. 348. Stow's Annals, fo. 414.

§ The parish of Ludford is partly in Herefordshire and partly in Shropshire.

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battle was hourly expected, when the desertion of Sir Andrew Trollop, with a considerable body of men, and a pardon offered by the King, discouraged the Yorkists, and caused their immediate dispersion. York, with his son, the young Earl of Rutland, fled first into Wales, and from thence into Ireland, and the Earls of March, Salisbury, and Warwick, escaped to Guernsey, and afterwards landed at Calais.* This bloodless victory was followed up by a Parliament being called, in the King's name, and it assembled at Coventry on the 20th of November, 1459, and York, Salisbury, Warwick, and many other Yorkist leaders, were, by an Act of Parliament, attainted as guilty of high treason, and their lands and possessions declared forfeited.†

In the summer of 1460, Edward, Earl of March (eldest son of the Duke of York), the Earl of Salisbury, the Earl of Warwick, and others, landed at Dover, in Kent,‡ and entered London with a large army, and were well received there. Salisbury and Sir John Wenlock (who had attached himself to the Yorkists) were left to lay siege to the Tower,§ whilst Edward, the Earl of Warwick, and other leaders, marched with the Yorkist army against the King's forces.

The King was at Coventry when the intelligence arrived, of the advance towards London of the Yorkists; and the Queen, in his name, raised a considerable army, with which the King and Queen marched to Northampton. The Queen encouraged her friends to fight, and promised great rewards to her adherents.‖

* Fabyan.

† William of Worcester. Holinshed. Rot. Parl., 38 Henry VI. (1459), vol. v. fo. 348. This Act of Parliament was repealed soon afterwards. See Rot. Parl., 39 Henry VI. (1460), vol. v. fo. 374.

‡ Fabyan.

§ William of Worcester. Holinshed.

‖ Hall, Holinshed, Grafton.

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On the 9th of July,* 1460, a bloody battle was fought in the meadows near Northampton, when the Yorkists obtained a complete victory.

Queen Margaret, the Prince of Wales, and the Duke of Somerset, escaped with difficulty, and fled to Durham.† She appears to have gone from thence with the Prince to Harlech Castle, in North Wales, and narrowly escaped being captured, and her jewels and baggage were taken, in Lancashire, by a servant of Lord Stanley; and she and the Prince afterwards proceeded by sea into Scotland.‡

The King was captured immediately after the battle, and conveyed to London, where a Parliament was called, and opened in his presence, on the 7th of October, 1460, and all Acts of the Parliament of Coventry were annulled.§

The Duke of York was in Ireland at the time when the battle of Northampton took place, but immediately upon receiving intelligence of the victory, he sailed from Dublin,‖ towards Chester. He landed at Red Bank, near Chester.¶ Although the name Red Bank does not appear to be at present given to any place in that part of Cheshire, yet it is mentioned by Leland, who states, that it is lower down the River Dee than Neston, that the villiage of Thurstaston is half a mile distant from it, and that the village of West Kirby is a mile and more lower down the Dee.** That description tallies exactly with the situation of Dawpool, which is close to Thurstaston, on the northern shore of the Dee, and fifteen miles from Chester. It seems by no means easy to discover any good reason for his landing

* Although the 9th of July is generally stated by historians, other days in that month have been mentioned by some as the date of the battle.

† Hall, Grafton. Speed states, that she and the Prince fled into the north.

‡ William of Worcester, Holinshed, Stow.

§ Rot. Parl. 39, Henry VI. (1460), vol. v. fo. 374.

‖ Holinshed, Hall, Grafton.

¶ Holinshed, p. 655.

** Lel. Itin. vol. v. p. 52 [54].

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so near Chester, instead of proceeding directly to it, and landing there; for he went to it immediately after disembarking. The Stanleys were Yorkists, and had possessions near the part of Cheshire where he landed. Was his object in landing there, to disembark at a place where he had some friends or supporters? From Chester he proceeded to London, presented himself before the House of Lords, and claimed the Crown, as being descended from Lionel, Duke of Clarence, third son of King Edward III., whilst Henry VI. derived his claim from his being descended from John of Gaunt, fourth son of King Edward III.; the result was, that is was declared by an Act of Parliament, that Henry should enjoy the Crown and Regal dignity during his life, and that the Duke of York should succeed him, upon his death or resignation.

No one who knew any thing of the disposition or courage of Margaret, could suppose that a queen of her talents, intrepidity, and determination, would sit down quietly, and acquiesce, without a contest, in a decision by which she was excluded from power, her son from the succession, and Henry was to have merely a life interest in the throne—

QUEEN MARGARET. "The soldiers should have toss'd me on their pikes,
Before I would have granted to that act.
But thou prefer'st thy life before thine honour:
And, seeing that thou dost, I here divorce myself,
Both from thy table, Henry, and thy bed,
Until that Act of Parliament be repeal'd,
Whereby my son is disinherited.
The northern lords that have forsworn thy colours,
Will follow mine, if once they see them spread;
And spread they shall be, to thy foul disgrace,
And utter ruin of the House of York."

Shakspeare's HENRY VI. Part iii. Act 1, Scene 1.

Margaret soon found herself in the north of England with the Earl of Northumberland, Lord Clifford,* Lord

* Both of these noblemen had recently lost fathers, slain in the Lancastrian cause.

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Dacre, John Lord Neville, and others of great influence, and they proceeded to raise forces. The Duke of Somerset, the Earl of Devonshire, and several knights and gentlemen of the western part of England also took up arms in her cause, and advanced by Bath, Cirencester, Evesham, and Coventry, towards York in order to join her.*

A skirmish or engagement took place at or near Worksop, in Nottinghamshire, between a portion of the forces of the Duke of York, probably his advanced guard, and a part of those of the Duke of Somerset, in which some of the former were slain.†

The battle of Wakefield speedily followed. It was fought on the 31st of December (some authorities state that it took place on the 30th of December‡) 1460; the Yorkists were completely defeated; the Duke of York, and many other leaders, were slain, and his son Edmund, Earl of Rutland, was murdered after the battle by Lord Clifford; Salisbury was captured, and he and some other prisoners were executed, either by Margaret's orders or with her sanction. Her conduct upon that occasion, and also as will be presently mentioned, after the second battle of St. Alban's, appears to show that the feelings of compassion and mercy, generally met with in woman, did not constitute part of her character.

On the 2nd of February following, the tide of success turned, and Edward, the eldest son of the late Duke of York, and who is usually called by historians the Earl of

* William of Worcester, page 484. Sir John Neville, commonly called John Lord Neville, was the brother and heir presumptive of Ralph Neville, second Earl of Westmoreland.

† William of Worcester, page 484. It is remarkable, that he appears to be the only old historical writer who notices the skirmish at Worksop. After mentioning the Duke of York's proceeding from London towards York, he adds as follows:— "præeuntes sui ad numerum * * * * * * * per gentes Ducis Somercecie interimuntur apud Worsop."

‡ The difference in the authorities as to this date, is pointed out in Brooke's Visits to Fields of Battle in England, of the fifteenth century, page 58.

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March, but who was in fact Duke of York after his father's death, completely defeated the Lancastrians, commanded by the Earls of Pembroke and Wiltshire, at the battle of Mortimer's Cross, in Herefordshire.

Margaret, exulting at her success at the battle of Wakefield, marched with her northern army towards London. She encountered an army of Yorkists, commanded by John Mowbray, Duke of Norfolk, and the Earl of Warwick, on Shrove Tuesday, the 17th of February, at St. Alban's. The Lancastrians entered the town, meaning to pass through it, in order to encounter their enemies, but met with a body of archers, posted near the great cross in the Market Place to oppose their passage, and were received with a storm of arrows, which came flying about their ears as thick as hail,* and were at first repulsed, and with some loss obliged to retire in haste to the west end of the own; there they effected an entrance by a lane, leading northwards, up to St. Peter Street, and had a sharp encounter with some bands of Yorkists, and after considerable slaughter on both sides, the Lancastrians got through, and encountered 4000 or 5000 of the Yorkists, upon Bernard Heath,† scarcely a mile from and on the north-eastward side of the town, and there the battle was fiercely fought by both parties; but at last the Yorkists were defeated. The only person of rank who fell in the battle, was Sir John Grey,‡ whose lovely widow, Elizabeth, afterwards became the Queen of King Edward IV.

* Holinshed. Stow.

† Holinshed, Stow. Both of these authors state, that the battle was fought upon the heath, and the latter adds, "called Barnard Heath, toward a little towne called Syndridge, in a place called No Mans Land." Sandridge village lies a very short distance beyond Bernard Heath, and in the Ordnance Survey Map, a place called No Mans Land is laid down, about a mile beyond Sandridge.

‡ Hall, Holinshed, Grafton, Baker, Stow. In the notes to my work, "Visits to Fields of Battle in England, of the Fifteenth Century," and also in a paper read by me before a meeting of the Literary and Philosophical Society of Liverpool, on the 2nd November, 1857, it has been inadvertently stated that

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On the 14th of July, 1858, I visited St. Alban's and the places where the battle was fought, and did not experience any difficulty in identifying the localities, which the old writers mention as being connected with the battle. The great cross has long been destroyed, but the spot where it stood may be ascertained with tolerable accuracy; the Market Place and St. Peter Street remain; and there is even yet a considerable portion of Bernard Heath open and unenclosed, which is still called by that name; and from the barren, rough, and irregular appearance which its surface exhibited when I visited it, there seems to be every chance of its remaining a heath, because it appears not to be worth cultivating.

By this defeat of the Yorkists, Margaret had the satisfaction of liberating King Henry, but Lord William Bonvile and Sir Thomas Kiriel, who had remained with him on his express assurance of safety, were beheaded in cold blood by her orders.

She caused the King to honour with knighthood, Prince Edward, and thirty persons who had fought on their side at the battle.*

Proclamation was made, prohibiting robbery or violence by the northern men of the King's army, but to little purpose; they were for the most part a lawless body of men, many of them borderers, and they asserted that they had been promised, as an inducement for them to take up arms, the spoil of every place after they had crossed the Trent; and most historians consider that such a promise had been made with Margaret's sanction.

Sir John Grey, of Groby, the first husband of Elizabeth, afterwards the Queen of Edward IV., lost his life fighting for the Lancastrian party at the *first* battle instead of the *second* battle of St. Alban's, as it ought to have been stated. Sir John Grey was the son of Edward Grey, Lord Ferrers, of Groby; his body was interred in the Abbey Church of St. Alban's; and his grave is distinguishable by a very small brass figure, of a knight in armour, upon the gravestone. It was pointed out to me, on my visiting the church, on the 14th of July, 1858. * Fabyan.

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In the march of the Lancastrian army southward, great acts of violence were committed by the northern men, borderers, and Scotch, who robbed, plundered, and even committed murder, without respect to persons or places. Churches were pillaged, writings destroyed, and persons forced under pain of death, to disclose valuable articles which had been concealed.* They destroyed, by fire, a large portion of the town of Stamford, and several churches there,† and greatly injured Grantham, Peterborough, Huntingdon, Royston, Melbourne, and other places in the way towards St. Alban's.‡ These acts of violence were very injurious to Margaret, and combined with a feeling of attachment to the Yorkist party, caused the Londoners to close the gates of the City against her.

The Lord Mayor, by her orders, took steps to forward a supply of provisions to Barnet, for her army, but the populace frustrated the design and stopped them at Cripplegate. Some of her northern horsemen approached, and commenced pillaging the suburbs, and would have entered at Cripplegate, but were repulsed, and three of them were slain. The Lord Mayor favoured the Lancastrian party, although the citizens generally supported the Yorkist party, and he sent to the Queen to make explanations or excuses; and negotiatons were spun out, until she learnt that Edward was rapidly approaching. His army was strengthened by the addition of a portion of the forces of the Earl of Warwick, that had escaped from St. Alban's, and with which Edward had effected a junction, at Chipping Norton, near Cotswold.§

* Continuation of the Chronicles of Croyland, Hall, Holinshed, Stow, Rot. Parl. 1, Edward IV. (1461), vol. v. fo. 476. In the continuation of the Chronicles of Croyland, is an interesting account of the alarm caused by the approach of Margaret's army towards Croyland, and the precautions taken at the Abbey there, against a visit from it.

† Lel. Itin., vol. vi. fo. 29 [p. 25]; vol. vii. fo. 20 [p. 10]. Peck's Annals of Stamford.

‡ Stow.

§ Hall, Holinshed, Grafton, Stow, Speed.

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Margaret has been censured by some writers, as if she had committed a great blunder, in not promptly advancing to London, immediately after her victory at St. Alban's, and taking advantage of the consternation caused by that event; but there seem to have been some good reasons for her not precipitately adopting that course. The lawless habits of the borderers and northern men, who constituted a large part of her army, and the risk to which the capital of her husband's kingdom would have been exposed, if she had introduced such guests into it by force; the possibility, that a movement in her favour, might soon occur in the city to facilitate her entrance into it; and the rumours of the advance of the Yorkists under Edward, seem to have constituted sufficient reasons to induce her not hastily to march to, and endeavour to compel the citizens to admit her into London.

The forces of Edward were then superior in number to the Lancastrian army, and Margaret, therefore, felt herself obliged to retire to the north of England.

Edward entered London in triumph. He was proclaimed King, on the 4th of March,* by the title of Edward IV., and immediately afterwards marched northward with his army to encounter that of his enemies. The Lancastrians mustered a very large army at York; and Henry, with the Queen and Prince Edward, remained there, whilst the Lancastrian forces marched through Tadcaster, and took up their position between two and three miles beyond it, at Towton, and there awaited the approach of the Yorkists.

The first hostile meeting of the rival forces was unfavourable to the cause of Edward. Early in the morning of the 28th of March, Lord Clifford, at the head of a body of light cavalry,† seized the bridge at Ferrybridge,

* Fabyan's Chronicles, Rot. Parl. 1, Edward IV. (1461), vol. v. fo. 464.

† Hall, Holinshed, Grafton.

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surprised and defeated some Yorkist forces that had been posted at that place, to secure the passage over the river Aire; and their commander, Lord Fitzwalter, and the Bastard of Salisbury, who also held a principal command in the Yorkist forces, were slain in the action.*

I visited Ferrybridge and Castleford on the 3rd of August, 1858, and although I attentively inspected the River Aire at both of those places, I was quite unable to discover any important motive, to induce the Lancastrians to detach, as they did, troops under Lord Clifford, to attack Lord Fitzwalter and seize the position at Ferrybridge, without also sending a large body of forces to support Lord Clifford, and preserve the passage over the river after he had won it; and even then, unless the other passages over the Aire had also been secured by them, it would not have prevented the Yorkists from crossing it elsewhere.

Edward's army was at the time of this engagement at Pontefract; and Lord Falconberg, Sir Walter Blount, and Robert Horne, immediately crossed the Aire at Castleford, with the van of the army. Lord Clifford and his forces were intercepted at Dintingdale, near Saxton, in their retreat towards Towton, and he and Sir John Neville, commonly called John, Lord Neville (the brother of Ralph Neville, second Earl of Westmoreland), also fighting on the Lancastrian side, were slain there, and their forces were nearly all destroyed.†

On the next day, Palm Sunday, the 29th of March, 1461, the rival armies encountered each other, and the sanguinary and terrible battle of Towton was fought. It terminated in a complete defeat of the Lancastrians, but with

* Hall, Holinshed, Grafton, Habington's Life of Edward IV. Fenn's Collection of Original Letters, vol. i. pp. 205, 219.

† Hall, Holinshed, Grafton, Speed, Habington's Life of Edward IV. The latter writer, by mistake, calls Lord John Neville, the son of the Earl of Westmoreland.

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prodigious slaughter on both sides, and the destruction of the greatest part of the noblemen, knights, and gentlemen, and of many thousands of the common soldiers who fought for Henry at that battle.

Henry, with Margaret and Prince Edward, fled northward, accompanied by the Duke of Somerset, the Duke of Exeter, Lord Roos, and Lord Hungerford. At first they went to Berwick; and Henry, Margaret, and Prince Edward proceeded from thence to Edinburgh, and in order to ensure a safe refuge, Henry delivered up to the Scotch King the Town and Castle of Berwick. Margaret and Prince Edward were afterwards safely conveyed to France, whither she went in order to solicit the aid of her father, and her relative, King Louis XI., who had not long previously succeeded to the throne of France, upon the death of his father, King Charles VII., and Louis was induced to prohibit all Edward's friends from trading or staying in his dominions.

Edward was crowned at Westminster on the 29th of June, 1461. A parliament was held in November following, by which his right to the throne was solemnly recognised.

Whilst Henry remained in Scotland, Margaret was exerting herself in soliciting assistance from the King of France. She at last, in 1463, obtained from Louis some French soldiers, but far too few to be of much use to her; and, in fact, Louis only seemed disposed to assist her in a trivial and underhand manner. With these she embarked and proceeded to Northumberland and to the mouth of the Tyne; but she was opposed and compelled to retire with precipitation.

Margaret's ill fortune still pursued her; a storm came on, and the ship in which she sailed was separated from the others of her fleet, and she succeeded with great difficulty in landing at Berwick. The rest of her ships were

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driven before Bamborough Castle, where her troops were obliged to set them on fire, and to retire to Holy Island; they were there attacked by Edward's soldiers, who slew part of them, and the rest became prisoners, except their commander, who escaped in a boat to Berwick.

Margaret soon afterwards, assisted by the Scotch, prepared to invade England, in consequence of which Edward assembled a powerful army, and marched northward, in order to encounter the forces of Margaret.

In this expedition he had the support of great numbers of the nobles, knights, and gentlemen of England. The following is a list of the principal personages who accompanied him, which is given by Stow in his Annals:— "King Edward beganne his journey toward Scotland on the Feast of St. Andrew the Apostle, accompanied of Dukes, Earles, Barons, and Knights, as followeth: the Dukes of Norfolke and Suffolke; the Earles of Arundell, Shrewsbury, Worcester, Kent, Westmerland, and Essex; the Barons Lord Grey, Ruthen, Lord Hastings, Lord Grey, Codnar, Lord Grey, Wilton, Lord Anthony Scales, Lord Latimer, Lord Herberd, Lord Ferrers of Chartley, Lord Stanley, Lord Wenloke, Lord Grestoke, Lord Ogill, Lord Lomley, Lord Clinton, Lord Southwike, Lord Barnes, Lord Dacre of the South, Lord Dacre of the North, Lord Say, Lord Cromwell, Lord Cobham, Lord Leverforth, Lord Henry Buckingham, Lord Mortimer, Lord Fitzhugh, Lord de la Ware, Lord Powes, Lord Scropen of Bolton, Lord Dudley, Lord Sturton, Lord Burgaveny; Knights Sir Peirce Aleigh, Sir William Stanley, Sir William Storis, Sir Thomas Montgomery, Sir J. Canis, Sir Ralph Pigot, &c., to the number of fifty-nine knights."*

Edward first sent forward John Neville, Lord (subsequently Marquis) Montague, with a portion of the army, and afterwards marched in person with the main body.

* Stow's Annals, pp. 416, 417.

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Margaret, bringing her husband with her, but leaving her son at Berwick, entered Northumberland at the head of an army, at first consisting principally of Scotch, but which continually increased, in consequence of great numbers of the English of the Lancastrian party joining her. Henry Beaufort, Duke of Somerset, who had recently made his peace with Edward, now revolted, and with Sir Ralph Percy and others joined her army. Montague marched to Durham, where he received reinforcements; and he continued his march, and at Hedgeley Moor routed a considerable body of the Lancastrians, and slew Sir Ralph Percy. Margaret's ill-fortune still prevailed, and Montague soon afterwards attacked the Lancastrian army at Levels, near Hexham, in Northumberland, where a battle was fought, called, from that circumstance, the Battle of Hexham. Henry's forces were completely defeated, with great slaughter,* and the Duke of Somerset, Lord Molyns, and others of the Lancastrian party, were taken prisoners and soon afterwards beheaded.

Henry and Margaret escaped into Scotland, but the former was in great danger after the battle, and was indebted to the swiftness of his horse for his safety. Monstrelet, the old French historian,† states, that Margaret and Prince Edward fell into the power of some robbers in a forest, who plundered them, and were disposed to have killed them; but a quarrel about the booty arose, during which she took her son in her arms,‡ and fled into a thick part of the forest, where they encoun-

* The battle is said, by some historical writers, to have been fought in 1463; but there are several authors of credit, who mention the year 1464 as the year in which the battle was fought.

† Monstrelet (A.D. 1463), vol. iii. fo. 96.

‡ "Elle print son fils entre ses bras."—Monstrelet. As the Prince was born in 1453, a lad about ten years old would have been rather an uncomfortable weight to carry in a forest.

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tered one of the robbers, to whom she made herself known, and he, in a fit of generous compassion, was induced to protect them; and, that by his assistance, she got with her son to the sea-side, embarked, and went to Sluys, and from thence to Bruges.*

Such an adventure forms a pretty episode for a romance or the drama, but unfortunately it appears to want the all important ingredient of truth. Did Monstrelet suppose that Margaret and Prince Edward were travelling on foot towards Scotland after the battle? or, did he reflect upon the fact, that Prince Edward was about ten years old at the time; and upon the difficulty, if not the impossibility of Margaret's carrying a boy of the weight naturally incidental to that age, far in her arms? Besides the great improbability of the tale, it happens that not one of the ancient English historians, as far as I am aware, mentions it; and what is decisive against its truth, Prince Edward was not with Margaret at the battle of Hexham, and, therefore, could not have accompanied her in her flight. He did not even enter Northumberland with her, when she came from Scotland, before the battle. Of this we have the positive evidence of our old chroniclers and historians, Hall, Holinshed, Grafton, Baker, Stow, and Speed, all of whom distinctly state, that when Margaret marched into England, she brought her husband with her into Northumberland, but that she left her son, Prince Edward, for safety at Berwick. Nor is this all, for the next time that the four first of these historians mention Margaret, after the battle of Hexham, they inform us, that she sailed from Scotland, and took refuge in France, which is not reconcilable with the statement, that a

* Monstrelet. Hume repeats the story, and seemingly without ever looking into any authorities, or ascertaining anything as to its correctness, or otherwise; an accusation which has been brought against him in many other instances. Lingard also repeats the tale, as if he took it as a thing of course, to be true.

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robber escorted her, in Northumberland, in safety to the coast, and that she embarked and proceeded to Sluys.

Henry remained some little time in Scotland, but from some cause, which remains a mystery, possibly fearing that he might be delivered up to Edward, he ventured from thence into the north of England,* in disguise, and was some time in concealment, shifting from place to place, but was at last captured by Sir James Harrington,† at Waddington Hall, in Lancashire, whilst he was at dinner, and was conveyed to London, in an ignominious manner, and confined in the tower.

Margaret, however, being desirous to solicit the aid of King Louis, quitted Scotland, and proceeded with Prince Edward to France, and took refuge with her father.

It is foreign to the objects of this paper to dwell upon the various important events which occurred in England, during the absence of Margaret; such as Edward's marriage with the beautiful Elizabeth, the widow of Sir John Grey; the dissensions and enmity which arose between Edward and his brother George, Duke of Clarence, and also between Edward and the Earl of Warwick; the marriage of Clarence with Isabel, the eldest daughter of Warwick; the battles of Banbury‡ and Hornfield, or Lose-coat-field;§ it being intended to confine this paper

* One of our old historians (Stow) states, that Henry fled into Lancashire, upon the loss of the battle of Hexham, and remained there until he was captured; but the more credible account seems to be, that he and Margaret escaped into Scotland upon that occasion.

† Rymer's Fœd., vol. xi. fo. 548.

‡ The battle was fought on the 26th of July, 1469 (See Stow's Annals, 442), at Edgcott, in Northamptonshire, but near Banbury, and on the confines of Oxfordshire.

§ It is called the battle of Hornfield, or Lose-coat-field, or Stamford, and was fought at a place called Horn, in Rutlandshire, but near the borders of Lincolnshire, and between four and five miles from Stamford, and on the Stamford side of Horn Toll-bar, which is upon the turnpike road leading from Stamford towards the North. It was fought in the month of March, 1649-70 (See Stow's Annals, 422). I visited the field of battle on the 23rd of May, 1857, but was unable to obtain any information of any relics, or indicia of the battle, having been discovered there.

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as much as possible to the events more immediately connected with Margaret's career.

Margaret and her son continued to reside in France for several years, as unfortunate exiles, seemingly deprived of all hope of the restoration of Henry to the throne; when, in consequence of the dissensions between Edward and the Earl of Warwick, and of the feelings of exasperation which existed in the mind of the latter against the former, Warwick began to entertain the project of dethroning Edward, and of reinstating Henry; and he succeeded in inducing the Duke of Clarence, who also considered himself much aggrieved by Edward's conduct towards him, to join in the scheme.

In consequence of some hostile measures against Edward, which the Duke and Earl appear to have encouraged, but which were prematurely commenced by others, it became requisite for the safety of Clarence and Warwick, for them precipitately to leave England, and accordingly, in April, 1470, they embarked at Dartmouth,* in Devonshire, and proceeded to France.

Louis kept his Court, at that period, at Amboise, and on Warwick's landing in France, invited him thither, and received him with much distinction; and Margaret, who was then living with her father, and had repeatedly solicited the aid of Louis, hearing of Warwick's arrival, came to Amboise with Prince Edward, and also with Jasper, Earl of Pembroke, and John, Earl of Oxford, both strenuous supporters of the Lancastrian party, who had taken refuge in France.

A reconciliation was effected, by the intervention of Louis, between Margaret and Warwick; and as they and Clarence now looked upon Edward as their common enemy, they all laid aside they mutual feelings of animosity, and a confederacy was formed by them for his dethronement.

* Hall, Holinshed, Grafton Stow, Speed.

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It has been already mentioned, that Clarence had married Isabel, the daughter of Warwick. In order firmly to unite the interests of Warwick with those of the House of Lancaster, it was agreed, that Prince Edward should marry Anne, the second daughter of Warwick, which marriage took place accordingly; after which event, Clarence, Warwick, and the two other Earls, took a solemn oath, never to desist from their exertions, until Henry was restored, or Prince Edward obtained the crown of England.

Preparations were made for a landing in England; and Louis furnished some ships, troops, and money, but not to any great extent, for his principal object seems to have been to foment discord amongst the English, and prevent their interfering in his affairs.

Edward was very uneasy at what was going on in France, and was very desirous to win back Clarence to his party; and by means of a lady of considerable talents, who held an appointment under the Duchess of Clarence, (and consequently was the less likely to be suspected), he contrived to open a communication with him, for a reconciliation; and the result was, the promised defection of Clarence from the confederacy, and his assurance that he would join Edward, whenever he could do so, at a convenient opportunity.

In a short time the preparations were complete, and Clarence and Warwick arranged with Margaret, that they should first make a descent in England, and if matters succeded to their wishes, that Margaret should follow with the Prince. Accordingly, in September, 1470, Clarence and Warwick landed with the Earls of Pembroke and Oxford, at Dartmouth;* Edward was driven from

* Fabyan. Stow, however states, that on the 13th of September, Warwick, Clarence, and Oxford, landed at Plymouth, and that Pembroke and others landed at Dartmouth.

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his throne and kingdom, embarked as a fugitive at Lynn Regis, on the 3rd of October:* and took refuge in the Low Countries; and in the second week in October,† Henry was liberated from the tower and restored to the throne. Soon afterwards, the Earl of Warwick was made Ruler and Lieutenant of the Realm, but the Duke of Clarence was associated in authority with him.‡

Margaret, rejoicing at what soon turned out to be only a transient gleam of success, prepared to proceed with Prince Edward to England; but more misfortunes awaited her, for adverse winds and tempests prevented for a long time her departure from France.

Edward obtained some few ships and money from Charles, Duke of Burgundy (the husband of Margaret, the sister of Edward), embarked at Zealand with 2000 soldiers, besides mariners, and landed on the 14th of March, at Ravenspur, at the mouth of the Humber, in Yorkshire, proceeded to Beverley, and sent to Kingston-upon-Hull, requesting admittance into that town, but was refused. He then marched with his forces to York, and without claiming the crown, caused it to be given out, that he merely claimed the Dukedom of York, and the inheritance that he had succeeded to, in right of his father, the late Duke of York; an ambiguous expression, inasmuch, as by an unrepealed enactment of Parliament, his Father had been declared entitled to the inheritance of the Realm and Crown of England. Edward was received into York without resistance, where he refreshed his forces, and proceeded to Tadcaster, and thence to Wakefield (where some people, but not many, joined him), and Sandal, a Lordship which belonged to the Duke of York, and left Pontefract, a short distance on the left hand, where John Neville, Marquis of Montague, brother of the

* Stow. † Fabyan. ‡ Polydore Virgil, Hall, Holinshed.

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Earl of Warwick, was posted with some forces, but who suffered Edward to pass unmolested.*

Some authors have been perplexed to discover why the Marquis of Montague did not then attack Edward, and why the latter was permitted to march through Yorkshire without opposition from any quarter; but the reason for it is easily found, for we have the evidence of a contemporary statement of high authority† that the forces of Montague were inferior both in number and efficiency to those of Edward; that considerable disinclination to act hostilely against the latter, existed amongst many people thereabouts, so long as he professed merely to claim the Dukedom of York; that the Earl of Northumberland, who had great sway and influence in those parts, and who favoured Edward's cause, remained quiet, without taking any steps or declaring himself against him; a line of conduct (probably intentionally adopted with Edward's sanction) which was of great service to him; and that the noblemen and commons thereabouts would not stir against him with any nobleman, except the Earl of Northumberland, or at least not without his orders.‡ It seems also not improbable, that Montague was at that time rather wavering in his principles, notwithstanding he lost his life soon afterwards, fighting on the Lancastrian side, at the battle of Barnet.

Edward marched on to Doncaster, and thence to Nottingham, where he received a considerable augmentation of his army, and approached Newark, when the Duke of Exeter, the Earl of Oxford, and others who were posted there, evacuated the town on his approach, and Edward returned to Nottingham. From thence he proceeded to Leicester, where 3000 men, raised by the influence of Lord Hastings, joined him. On the 29th of March, Edward

* Historie of the arrivall of Edward IV., in England, in 1471, published for the Camden Society. † Ibid. ‡ Ibid.

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advanced with his army before Coventry, where the Earl of Warwick had taken up his position, and offered the latter battle, which he declined. Edward then proceeded to Warwick, where he was received as king, and resumed his royal title, and from that time so proclaimed himself.*

At Warwick, the Duke of Clarence, disregarding his oath, deserted the Lancastrian party, and with 4000 men, joined Edward. Still finding that he could not tempt Warwick from his position at Coventry, where the latter remained until he was reinforced by the Marquis of Montague, the Duke of Exeter, the Earl of Oxford, and others, Edward, on the 5th of April, marched with his army southward, passed through Daventry Northampton, and St. Alban's, and was joyfully received into London, which he entered on Thursday, the 11th of April;† and Henry doomed once more to descend from the throne, again became a prisoner.

On Easter Sunday, the 14th of April, 1471, the sanguinary battle of Barnet was fought, between Edward and the Earl of Warwick, which terminated in a complete victory obtained by Edward over the Lancastrians, when his mortal enemy the Earl of Warwick, the Marquis of Montague, and great numbers of the Lancastrian forces lost their lives.

Margaret had embarked on the 24th of March,‡ at Honfleur, in order to leave Normandy for England, but was obliged to put back or re-land more than once, and her departure was sadly delayed by storms and adverse winds; so that from the time of her first embarkation about twenty days elapsed before she reached England. At last she landed at Weymouth, on the 14th of April,§

* Historie of the Arrivall of Edward IV. in England, in 1471, published for the Camden Society. † Ibid. ‡ Ibid.

§ Ibid. Baker also states, that she disembarked at Weymouth, but differs from most other writers as to the place of her embarkation, which he calls Harfleur.

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with her son Prince Edward, and several persons of distinction, accompanied by a small body of French and other troops, and proceeded to the Abbey of Cerne,* not far from that port.

This most unfortunate and unhappy princess was now doomed to experience far greater misery than any that had yet fallen to her lot. The dismal tidings soon reached her ears of the return and restoration of Edward — the defection of Clarence, and his joining her enemies — the battle of Barnet — the deaths of Warwick and Montague — and the captivity of her husband. At first she was almost broken-hearted and overwhelmed with the disastrous news; but, in consequence of the encouragement and representations of several noblemen and personages of rank and influence,† who came forward and offered their support, she determined once more to try the chances of an appeal to arms; but she was anxious to send the young Prince to France for safety. In that respect, however, she was over-persuaded by her friends and supporters.‡

* See Holinshed's Chronicles, and Speed's Historie. Hall, Grafton, and Dugdale, however state, that Margaret proceeded to the Cistercian Abbey of Beaulieu, and took sanctuary there. Baker in his chronicles, mentions that she first went to the Abbey of Cerne, and "then to Bewly [Beaulieu], in Hampshire." It seems very improbable that she would take sanctuary anywhere, instead of returning to France, which it is only reasonable to conclude she might have done if so disposed, in one of the ships which brought her and her forces to England. In the "Historie of the Arrivall of Edward IV. in England," before quoted, which, from having been written contemporaneously with these events, must be considered the most authentic, it is distinctly stated, that she went from Weymouth to "an Abbey nere by, called Seern" [Cerne], where the noblemen, and others of her party, waited upon her, and welcomed her into England; but it does not contain the slightest suggestion of her taking sanctuary, either there or elsewhere, before the battle of Tewksbury.

† Edmund Beaufort, Duke of Somerset; Thomas Courtenay, Earl of Devonshire; John Lord Wenlock; Lord John Beaufort (also called John of Somerset, Marquis Dorset); the Prior of St. John's; and others. — See Holinshed, and Historie of the Arrivall of Edward IV. in England in 1471.

‡ Holinshed.

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The noblemen and gentlemen of her party immediately proceeded to assemble forces in Somersetshire, Dorsetshire, Cornwall, Devonshire, and part of Wiltshire.*

Margaret soon afterwards repaired to Exeter, and proceeded from thence with her forces by Taunton, Glastonbury, Wells, Bath, and Bristol, where she received considerable aid in men, money, and artillery; and from thence marched by Berkley towards Gloucester, in the hope of being admitted into it, in order to pass the Severn there, and by that course to effect a junction with the forces of the Earl of Pembroke.

Here again Margaret was doomed to disappointment and misfortune. The Governor of Gloucester, by Edward's orders, refused to admit her, and she was consequently under the necessity of proceeding to Tewksbury, hoping to effect the important object of passing with her army over the Severn at that place.†

Edward in the meantime was active and vigilant. On the 24th of April, he marched from Windsor with an army, and proceeded by Abingdon, Cirencester, Malmsbury, Sodbury, over Cotswold, and by Cheltenham, and on the afternoon of the 3rd of May, he overtook Margaret at Tewksbury.‡

On the 4th of May, 1471,§ Edward attacked the army of Margaret at Tewksbury. A sanguinary battle took place, and he obtained the victory, which terminated for ever all serious hopes of the Lancastrian party against Edward.

The cup of misery was now drained to the dregs by Margaret. The battle was decisive; most of the Lancastrian noblemen, knights, and gentlemen, and great numbers of the common soldiers were slain. Prince Edward was barbarously murdered in cold blood by some

* Historie of the Arrivall of Edward IV. in England in 1471, published for the Camden Society.—Holinshed.

† Ibid. ‡ Ibid. § Ibid.

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of the Yorkist leaders; and the Duke of Somerset, the Prior of St. John of Jerusalem, and several others of her friends, were, two days after the battle, executed in the Market Place of Tewksbury.

On the 7th of May, Edward left Tewksbury for Worcester, and when on the way, he learnt that Margaret had been discovered in a poor religious house; and Edward having proceeded from Worcester to Coventry, where he arrived on the 11th, Margaret was brought to him there,* and was conveyed by his orders to London and imprisoned in the Tower. Some years afterwards, she was ransomed by her father for 50,000 crowns; but as he was too poor to raise the amount without assistance, he arranged with King Louis, for the latter to provide the money, in consideration of which, the succession of Provence and Anjou was conveyed to Louis; and accordingly, Margaret was delivered up by Edward's orders, by Sir Thomas Montgomery, on the 9th of January, 1476;† she proceeded to France, and in consequence of this arrangement, all the dominions of her father, eventually, became united to that kingdom.

Very soon after the battle of Tewksbury, Margaret was exposed to additional affliction by the death of her husband; Henry having died in the Tower of London on the 23rd of May, either by violence or from natural causes: historians differ upon that point.

Margaret continued in France during the remainder of her life, which she passed in retirement; nothing more occurred respecting her, as connected with England, and she died in 1482.

Thus terminated the life of Margaret of Anjou, during many years of which she was Queen of England. By her personal beauty, fascinating manners, accomplish-

* Historie of the Arrivall of Edward IV. in England, in 1471.

† Carte, vol. ii. p. 795.

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ments, and talents, she was well qualified to have been very popular with the English; and if her disposition had equalled her abilities, and she had exerted herself to the advantage of England, and had endeavoured to have made up, by a good and laudable government, for the incapacity of Henry, she might have been of incalculable benefit to the nation, and been held up to the admiration of posterity; but the good of her husband's subjects was foreign to her thoughts; such valuable qualities as she possessed, were rendered nugatory by her ambition, arbitrary conduct, and fondness of power. Margaret, well aware of the feebleness of Henry's mind, and confident in herself, attempted to uphold the government by her own strength; it tottered — and her efforts were redoubled, but were unavailing; it fell — and its fall involved her husband, her son, her friends, and herself, in one common, irreparable, and disastrous ruin.

A second paper was then read—(see page following); after which the Society resolved itself into an EXTRAORDINARY MEETING, to consider for the second time, and finally, the resolution of the 18th October—(see page 4).

Upon the motion of the Secretary, seconded by the Rev. H. H. Higgins, that resolution was confirmed, and the alterations in the times of meeting became part of the Laws.

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VISIT TO THE ANCIENT CHURCH AND SITE OF THE CASTLE OF FOTHERINGAY.

By RICHARD BROOKE, Esq., F.S.A.

On the 20th of May, 1858,* I, accompanied by one of my daughters, visited the village of Fotheringay, which is in the parish of that name, in Northamptonshire, and about three miles and a-half from the small market town of Oundle. Fotheringay is charmingly situated upon the north side of the River Nen or Nene, which flows past it, through a tract of beautiful and extensive meadow land; and although now merely a country village, it was once a market town.

In the approach to it from Oundle, its ancient Church, which stands upon elevated ground, forms a very conspicuous and handsome object.

The church was formerly collegiate, and judging from the portion which remains, it must have been a very grand and beautiful edifice. The nave was erected pursuant to the intentions of Edward Plantagenet, Duke of York, in the fifteenth century, and probably the foundation of that part was laid in the reign of King Henry V.; but it appears to have been completed, or nearly so, in the reign of King Henry VI.†

A college also formerly stood there, which Edmund of Langley, Duke of York and Earl of Cambridge, had

* I had previously visited Fotheringay on the 2nd of June, 1857.

† The choir is said to have been erected by Edmund of Langley, Duke of York; although his son, Edward, Duke of York, projected the nave, and took some measures for the fulfilment of his intention to erect it, yet he did not live to see any progress made, and the plan was carried into execution by his nephew, Richard, Duke of York; but it seems probable that the building was not finally completed until the time of King Edward IV., who erected the Cloister.—Bonney's Historic Notices of Fotheringay.

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intended to have erected, and procured a license to do so, but was prevented by death; his son Edward, Duke of York, however, founded and endowed the College; which was afterwards confirmed by King Henry V., who bestowed upon it some lands, which had belonged to Alien Priories. King Edward IV. made the college of his own foundation, and built some part of it. At the dissolution its revenue amounted to £419 per annum.

The village was also celebrated for its strong and handsome castle, which stood on the eastward side; an edifice, memorable in history in consequence of having been a principal residence of the illustrious Princes of the powerful House of York; the birth-place of King Richard III., the youngest son of Richard Plantagenet, Duke of York; and the scene of the trial, and the place of the execution, of the beautiful, unfortunate, and cruelly-used Mary, Queen of Scotland.

Several of the Plantagenets, members of the House of York, were interred in Fotheringay church.

Edmund Plantagenet (called of Langley, from having been born at Langley, near St. Alban's), Duke of York and Earl of Cambridge, was the fifth son of King Edward III., and died on the 1st August, 1402, and was buried at the Friary of Langley. He had by his wife Isabel, daughter of Peter, King of Castile and Leon, two sons, Edward, who succeeded him as Duke of York, and Richard, Earl of Cambridge, and a daughter, Constance, who married Thomas Le Despenser, created Earl of Gloucester. The eldest son, Edward, Duke of York, died a soldier's death in the field, valiantly fighting in command of the van of the English army, at the glorious battle of Agincourt, on the 25th October, 1415; his body was brought to England, and was buried in the choir of Fotheringay church, under a flat marble, with his figure in brass, inlaid, according to his will. The second son,

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Richard, Earl of Cambridge, was executed at Southampton, on a vague and rather improbable charge of treason, in 1415,* and was interred in the chapel called God's House, at Southampton. He left a son, Richard, Duke of York, and a daughter, Isabel, married to Henry Bourchier (of the potent house of Bourchier), Earl of Essex, and Viscount Bourchier.

Richard, Duke of York, was the claimant of the Crown of England, and the formidable rival of King Henry VI., and was slain at the battle of Wakefield, in 1460. His body was first interred at Pontefract, but was afterwards removed, and re-interred with great pomp and ceremony at Fotheringay, on the 30th July, 1466. A full and interesting account of the ceremony of the removal and re-interment of his remains, is given by Sandford, Lancaster Herald of Arms.† The Duke of York's widow, Cecily, Duchess of York, daughter of Ralph Noville, first Earl of Westmoreland, lived some time at Fotheringay, and died at the Castle of Berkhampsted, on the 31st May, 1495, and was interred by the body of her husband, in the Church of Fotheringay.

Edmund, Earl of Rutland, the third son of Richard, Duke of York, and Cecily, his wife, was murdered, when about twelve years of age, by Lord Clifford, after the battle of Wakefield, in 1460, and was first interred at Pontefract, but his remains were removed from thence, at the same time as those of his father, and re-interred in Fotheringay Church.‡

When the choir was destroyed, the altar was placed at the eastern end of the Nave, and afterwards, in Queen Elizabeth's time, the graves of her ancestors, the Dukes of York, being neglected amongst the ruins, she caused

* Fabyan and other authorities give 1415 as the date of the execution of Cambridge, but Sandford states it to have been in 1414.

† Sandford's Genealogical History, p. 373.

‡ Sandford, p. 373.

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the bodies of Edward, Duke of York, and Richard, Duke of York, and Cecily, his Duchess, to be removed from the places in the church, where they had been originally deposited, wrapped in lead, and to be re-interred near the present altar. Monuments of plaster, now white-washed, were also erected over them, by orders of Queen Elizabeth. A good description of them is given in Gough's Additions to Camden's Britannia. That description still applies correctly to them, except that since the time when he wrote, the present inscriptions seem to have been substituted for ancient ones, which had probably become illegible by lapse of time.

Leland, the Antiquary, who wrote in the reign of King Henry VIII., has left us the following account of Fotheringay:—

"From Oundale to Foderingeye a two miles, by mervelus fair corne ground and pasture, but litle woodde.

"King Edward the 4th for the love that he bare to Foderingey, had thought to have privelidgid it with a market, and with putting doun weres and mills, to have causid that smaul lightters might have cum thither.

"The toune self of Foderingeye is but one streat, al of stone building. The glorie of it standith by the Paroche Chirch of a fair building, and Collegiatid.

"This chirch and place wher the college is now, was sumtyme a nunnery. Edmunde of Langeley, sun to Edward the 3, got a licens, as sum saye, [to ma]ke a college there, [but he did] it not, [being] preventid [by dea]th.

[He left two] sunnes, Edward and Richard. This Edward began the College and endowid it meately welle. It chauncid that Richard, suspectid of Treason, was put to death, at Hamptoun, aboute such

The Nunnes of this House were translatid to De la Pray [by] Northhampton . . . . . where . . . . . of . . . . . .

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This Richard had a Sun, that was Father to Edward the 4th.

Tyme as King Henry the fiveth went ynto Fraunce.

"Whereapon at such Tyme as the Bataile of Agincourt shoulde be faughte, Edward desirid of King Henry to have the forewarde of the Batel, and had it, where be much hete and thronggid, being a fatte man, he was smoulderid to death, and afterward brought to Foderingey, and there honorably buried yn the bodie of the Quire, apon whose tumbe lyith a flat marbil stone, with an image flatt yn brasse.

After Edwarde's death, [Henry] the 5th, consid[eringe the good service], confirmid [the Colledg, and gave to] it certe[n landes of Priories of] monk[es Aliens, amongst which was the priory of Newet, com. Gloucester, by Leghe Market, in the borders of Wales.]

"Then cam after Edward the 4, and sumwhat enving the Glorie of Henry the fiveth, made the College of his oune fundation, and buildid sum part of it as it is now, and causid the body of his Father, Duke of York, to be brought from Pontefract thither, and to be layid on the North side of the Highe Altare, where also is buried King Edwarde the 4 mother, in a vaulte over the which is a pratie Chappelle.

"The faire Cloistre of the College was made in King Edwarde the 4 dayes, one Felde beyng Master of the College at that Tyme. There be exceeding goodly [meadowes by] Foderingey. [Foderingey] stondith [on the farther ri]pe of Avon. . . . . as I enterid [into] the Toune. [The bridg to Fotheringey] over Avon [is of timber].

This Felde sette [the Versis of the [book] caullid Æthiopum terras in the windowe with figures very neatly. Richard Sapcote, of Elton, Knight, the first setter up of the family in Huntington-shire, buried at Fotheringey, 1477.

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"The Castelle of Foderingey is fair and meately strong with doble Diches, and hath a Kepe very auncient and strong. There be very fair Lodgyns in the Castel. And as I hard, Catarine of Spaine did great costs in late tyme of refresching of it.

"This Castel longid of late tymes to Edmunde of Langeley, Edward the 3 sunne, and so lineally to the Dukes of York."*

A castle stood at Fotheringay as early as in the reign of King Henry III., which appears to have belonged to the Earls of Huntingdon.

Camden, who wrote in the reign of Queen Elizabeth, states, "A long while afterwards Edward III. gave it as an inheritance or appenage, as it was called, to Edmund of Langley, his son, Duke of York, who rebuilt the castle and the highest fortification, commonly called in castles the keepe, in the form of a fetterlock, the device of the House of York. Edward, Duke of York, his son, 2nd Henry V., and A.D. 1415, as appears by certain barbarous verses inscribed therein, built the beautiful collegiate church in which he was buried, being slain in the battle of Agincourt; as also Richard, Duke of York, his brother's son, slain at Wakefield, and his wife, Cecily Nevill, who all had magnificent monuments there, which being destroyed, together with the eastern part of the church, Queen Elizabeth caused two monuments to be erected to their memory, in the lower remaining part of the church. But such was the avarice of the persons that had the care of them, that they are thought by no means worthy of such princes, sons of kings, and progenitors of kings of England."†

In the additions to Camden's Britannia, by Gough, (of 1789), in describing Fotheringay, it is stated, that

* Leland's Itinerary, vol. i. p. 5 [fo. 4, 5.]

† Camden's Britannia. Title Northamptonshire, vol. ii. p. 166.

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"the town is delightfully situated on the Nene, which meanders along the meads to Oundle, two miles distant, but in a straight line scarce one. William Horwood, of this town, indented with the Duke of York's executors, 13th Henry VI., to build the nave, steeple, and two square porches for £300 sterling, the Duke to find carriage and stuff, for which purpose he enfeofft his castle and mansion here in trustees, and if Horwood exceeded the sum, or failed in performance, he was to become the Duke's vassal for ever. The revenues of the college were £419 per annum. At the dissolution, the college and their choir were pulled down, and the bodies of the founder and his family were left exposed till Queen Elizabeth's time, who ordered them to be interred, and the present monuments to be erected, which are exactly alike, in the style of that age, consisting only of a frieze charged with falcons and fetterlocks, supported by four fluted Corinthian pillars; in the middle of an ornamented square compartment the shield of arms, and on the base the same devices as on the frieze, and the inscription in Roman capitals almost effaced. An indulgence, penned in a fair Roman hand, was found about the neck of the Duchess with a silken ribband. The west wall of the cloisters remains, the arches stopped up. The steeple is surmounted with a handsome octagon tower, like Boston. The roof of the belfry is of ribbed stone.* The windows are full of painted figures, and devices, and saints much defaced. The inscription mentioned by Mr. Camden is painted on the south wall —

"In festo martyrii processu Martiniani
Ecclesiæ prima fuit hujus petra locata,
Aº X pi centem ac mille . . . . . .
Cum deca quarto H 5 tunc imminente secundo."

* It would perhaps have been much more clear and accurate, if he had stated, that the part of the roof of the nave, at the west end, under the belfry, is of stone; as will be more fully explained afterwards.

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On the north side of the church is a free school, founded by Henry VII. or Edward VI., endowed with £20 per annum for a master, payable out of the exchequer by the receiver of the county. On the north-west side of the church, in the town, is a building, now a barn, with a row of blank shields in quatrefoils; and on two shields, at bottom of the arch, Castile and Leon, and cheque."*

The church, dedicated to the Virgin and All Saints, is of rather light coloured stone, and must once have been a magnificent edifice, and what remains of it exhibits a very fine specimen of the Gothic architecture of the fifteenth century. After the reformation, and as it is said, in the reign of Edward VI., the choir and eastern part were destroyed; the nave, however, still remains, with its side aisles and clerestory. That portion is now used for divine service, and is very handsome and interesting.

The lower part of the tower of the church is square, with octagonal embattled turrets, and upon that part is an octagonal upper story or large lantern, of a very light and elegant appearance, and the tower is altogether commanding and handsome, and bears a resemblance to the beautiful one at Boston, in Lincolnshire. The nave has five large windows on each side, and the same number, but of course of smaller size, in the clerestory, which is supported by flying buttresses. The roof of the church is ancient and very lofty, of oak wood, with roses at the intersections of the beams and rafters; and the columns supporting it, and also the pointed arches, separating the nave from the side aisles, are exceedingly light and elegant.

The church cōntains, under a lofty arch at the west end, a remarkably fine and beautiful stone font, of an

* Gough's edition of Camden's Britannia of 1789, vol. ii. p. 182.

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octagonal form, apparently of about the early part of the fifteenth century; the basin is of very large size, so as to admit of the total immersion of an infant, and it is elevated upon two high steps. It is ornamented with foliage, and elegant Gothic compartments, and is supported by an octagonal pillar, corresponding in style to the upper part of the font. As King Richard III. was born at Fotheringay Castle, on the 2nd of October, 1452,* it is not only a reasonable inference, but there is the strongest probability that it is the identical font at which he was baptised.

The pulpit is of oak, and is quite as ancient as the period of the reformation; it was formerly painted green and gold, and is in good preservation. It is hexagonal, on a pillar, and ornamented with handsomely carved pannels inserted in borders of tracery. It is believed to have been brought out of the choir when that was dismantled.

The remains of cloisters mentioned in Gough's edition of Camden's Britannia, are no longer there, unless a boundary wall on the south side of the church-yard, may possibly form a portion; and the painted glass in the windows of the church is now gone. The inscription before mentioned still remains painted on a board on the south wall.

The portion of the interior of the roof of the nave which is at the west end, and under the tower, merits particular attention. It is vaulted with stone, most beautifully and elaborately carved, with ribs and veins of tracery. Its groinings, carving, and delicate ornamental work of stone, often called fan-work, or fan-tracery, are scarcely surpassed in beauty and elegance,

* William of Worcester. Hutton in his "Bosworth Field," p. 17, states, that Richard "was born on Monday, October 2nd, 1452, at Fotheringay, in Northamptonshire.

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by those of any stone roof in this country, and are little (if at all) inferior to those of King's College, Cambridge, or of Henry VII.'s Chapel, at Westminster. It is only to be regretted, that at Fotheringay the stone-vaulted portion of the roof is not of much larger extent.

On the left (northward) side of the present altar, is one of the monuments already mentioned; it is placed against the wall, and besides being ornamented with falcons and fetterlocks (favourite devices of the House of York), it contains the armorial bearings of Richard, Duke of York; France and England quarterly, with a label of five* points, impaling a saltier (Neville), for Cecily, his Duchess,; and over them is a tablet of wood, with the following inscription:—

"Richard Plantagenet, Duke of York, nephew to Edward, Duke of York, and father to King Edward IV., was slain at Wakefield, in the 37th year of Henry VI., 1459,† and lies buried here with Cecily, his wife.

"Cecily, Duchess of York, daughter to Ralph Neville, first Earl of Westmoreland."

On the right side of the altar is the other monument beforementioned, a counterpart of the former, and also placed against the wall, and ornamented with falcons and fetterlocks, and containing the armorial bearings of Edward, Duke of York; quarterly, France and England, with a label of five‡ points; and over it, upon a tablet of wood,

* According to Sandford, pp. 352, 362, 366, 368, each of the labels upon the coats of arms borne by these Dukes of York, ought to contain three points.—It is remarkable, that in Bridges' History of Northamptonshire, it is stated that the labels upon these monuments contain three points, whilst Bonney, in his account of Fotheringay, states that they contain five points.

† The date 1459 seems to have been inserted in the inscription by mistake instead of 1460. Although there is a difference, as is mentioned in my work, "Visits to Fields of Battle in England," title, "Battle of Wakefield," p. 58, between the authorities, as to the day of the month on which the battle of Wakefield was fought, yet all the authorities, as far as my information extends, give 1460 as the year of the battle.

‡ See the former note respecting the label.

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is the following inscription:—"Edward, Duke of York, was slain at the battle of Agincourt, in the 3d year of Henry V, 1415."

"These monuments were made in the year of our Lord 1573."*

There is not any monument or inscription to the memory of Edmund, Earl of Rutland, whose body was first interred at Pontefract, and afterwards removed, with that of his father, Richard, Duke of York, and re-interred at Fotheringay.†

Near the Church, but on the opposite side of the street, are an entrance gateway, and the front of an ancient building of stone, called the "New Inn," and it is reasonable to think that they have been parts of the Hostelrie or Inn of the College; they constitute the building which has been already mentioned in the extract from Gough's additions to Camden's Britannia. The entrance is under a Gothic arch, decorated in the front with roses and armorial bearings, and above it is a square-headed window, decorated in the same style. There are several shields of arms upon the front: France and England, quarterly, seemingly for King Edward IV.; the same impaling a saltier (Neville), for Richard, Duke of York, and his duchess, Cecily; Mortimer, for the Countess of Cambridge, mother of Richard, Duke of York; Castile and Leon, for Isabel, wife of Edmund of Langley, Duke of York, and daughter of Peter, King of Castile.‡

* These inscriptions appear not to be original ones, because, in Gough's additions to Camden's Britannia, he mentions, in describing the monuments, one inscription in Roman capitals, almost defaced. See also Bonney's Historic Notices of Fotheringay, p. 53, where he gives a copy of the original inscription in Latin, on the monument of Richard, Duke of York, with the date 1460, correctly stated.

† Ralph Brooke, in his catalogue of Nobility, &c., states, that the body of the Earl of Rutland was removed to Fotheringay, "and there buried by his father," probably meaning in the same tomb.

‡ I had not time to examine the above-mentioned armorial bearings with sufficient attention when I was at Fotheringay, and they are therefore given above

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These represent four generations of the House of York, in succession, and it may be inferred, and it appears very probable, that this edifice was erected in the reign of King Edward IV.

The site of the castle is well worthy of a visit, although all the walls have been completely demolished.

When Edmund of Langley, Duke of York, was in possession of the castle, it was much dilapidated, and he rebuilt the greatest part of it in the form of a fetterlock. The members of the House of York, at one period used the device of a fetterlock, and at another period a falcon, enclosed within a fetterlock.* The castle was one of their favourite residences, and it can scarcely admit of a doubt, that the extensive Forest of Rockingham, which abounded with game, and afforded abundant opportunities for the enjoyment of the pleasures of the chase, and is near to, and on the westward side of Fotheringay, was a great inducement to their selecting such a residence. It was at one time one of the largest forests in the kingdom, and extended for about thirty miles in length, from near Northampton almost to Stamford, and about eight in breadth, from the River Nen or Nene, to

merely as they are described by Bonney in his Historic Notices of Fotheringay, and I cannot take upon myself to say, whether they are in all respects accurately described. That work contains also some correct engravings of the front of the ancient building and entrance, the font, and views of the exterior and interior of the Church of Fotheringay.

* "This Edmond of Langley did bear also for an impress, a faulcon in a fetterlock, implying that he was shut up from all hope and possibility of the Kingdom, when his brother John began to aspire thereto. Whereupon he asked (on a time), his sons, when he saw them viewing this devise set up in a window, what was Latine for a fetterlock, whereat when the young gentlemen studied, the Father said, 'Well, if you cannot tell me, I will you: Hic, hæc, hoc, taceatis,' as advising them to be silent and quiet; and therewithal said, 'Yet God knoweth what may come to pass hereafter.' This his great grandson King Edward IV. reported, when he commanded that his younger son, Richard, Duke of York, should use this devise, with the fetterlock opened, as Roger Wall, an herald of that time, reporteth."—See Sandford's Genealogical History, p. 357, quoting Camden's Remains, p. 215.

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the Welland and the Maidwell. It is even now very large, and is supposed to contain from about eight to ten thousand acres.

Besides the birth of King Richard III., the youngest son of Richard, Duke of York, at Fotheringay, as has been already mentioned, the Duke of York had also two other children born there, viz., William, born on the 7th July, 1447, who died young; and a daughter, Margaret, who was born on the 3rd May, 1446,* married Charles, Duke of Burgundy, called Charles the Bold, or the Rash, on the 9th July, 1468, and died in 1503.†

From the manner in which Camden expresses himself relative to the keep, it should seem as if he thought that it was the keep which was made in the form of a fetter-lock. It was, however, not the keep, but the castle that was in that form. The lofty and nearly circular mount where the keep once stood yet remains, and it does not differ from those which may be seen in many other places, where keeps of castles have formerly stood.‡

The earthworks and outer moat sufficiently prove that the castle was built in the form of a fetterlock, with the flat face or portion on the westward side, and circular on the eastward portion.

The castle is believed to have been pulled down some time in the reign of King James I.; but there do not appear to be any good grounds for supposing, as has been suggested by some writers, that it was caused by any dislike of that King to it, in consequence of his mother's death there. The materials were used for various purposes, and it is said, and apparently with great probability, that part of the stones were used in

* William of Worcester. † Sandford, p. 380.

‡ It bears a strong resemblance to those on which the keeps of Sandal Castle and Wigmore Castle formerly stood, which are described in Brooke's "Visits to Fields of Battle in England of the 15th Century," pp. 64, 77.

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building the curious old edifice, the Talbot Inn, at Oundle, which appears to be of that period.

The keep was encompassed by an inner moat. Although all the stonework of the castle has been removed, nearly all the ramparts, earthworks, and moats remain, except on the westward side, nearest to the village, where the ramparts have been levelled, and the moat, which was formerly very wide, has been filled up, within the memories of many persons now living.

However strong the castle may have been, its strength must have been given to it by art, for nature does not seem to have contributed much to its strength, except on the south side, where the river flows, and has acted in some degree as a defence; and the meadows, and even the road leading over them, towards it, have always been subject to be occasionally overflowed, which circumstances must naturally have conduced to its security. A small mass of masonry, a few feet long, lies near the river, and seems to have slipped or been thrown down from the outer wall.

There are a number of fine hawthorn trees growing upon the site of the castle, and especially upon the mount of the keep; and visitors frequently carry away from them some of the sprigs when flowering, as memorials of the beautiful but unfortunate Mary, Queen of Scotland.

On this spot, on the 8th of February, 1587, Mary was beheaded,* and it is not easy to visit the place without reflecting upon the cruel and unjust treatment which she

* Mary's corpse was interred, in the first instance, in Peterborough Cathedral, and afterwards removed by the orders of King James I. to Westminster Abbey. It is remarkable, that in the Cathedral of Peterborough the remains of Queen Katherine, the divorced consort of King Henry VIII., lie interred on the opposite (North) side, to the spot where Mary was first buried. A very small brass plate, with a concise inscription of a few words, let into a very common grave-stone, marks the spot where Katherine lies. Her original tomb was destroyed by the Parliamentarian troops in the civil wars.

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was condemned to suffer, and upon the inhuman and unjustifiable conduct of her royal and powerful rival, Queen Elizabeth, in despotically imprisoning, for about nineteen years, and afterwards taking the life of the Sovereign of an independent state—conduct which must always be a blot upon the escutcheon of Elizabeth. That act of injustice and cruelty is the more to be deplored, because in very many respects, Elizabeth conferred incalculable benefits upon her subjects. She was a Sovereign upon whose reign Englishmen naturally reflect with pride and satisfaction; for during its continuance, the power, commerce, and greatness of this country increased in a surprising degree; she was popular with her subjects, and did more for the good and prosperity of England than any monarch who had ever preceded her.

THIRD ORDINARY MEETING.

ROYAL INSTITUTION, November 15th, 1858.

The REV. H. H. HIGGINS, M.A., V.P., in the Chair.

The resignation of Mr. John Wybergh, Jun., was received and accepted.

Dr. COLLINGWOOD exhibited a pair of lady's lace cuffs, made in Greece, from the fibre of the aloe; also the raw fibre and spun thread.

Mr. DYCE DUCKWORTH exhibited the *Teredo navalis*, taken from a ship in dock. Though the vessel was comparatively new, the injury done would amount to £400.

Mr. ARCHER, on behalf of Mr. Haram, exhibited a living chameleon, the history of which, in captivity, was curious.

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From a very graphic description by Mr. Haram, the following passage will be read with interest:—

In the autumn of last year I visited Egypt, and was very anxious to procure a chameleon. My wish was soon gratified. Among the articles kept "in stock" on board the "bum-boats," which, in Alexandria as in every foreign port, come alongside a vessel almost as soon as she casts anchor, it is rare during spring, summer, and autumn, not to find a chameleon. They are usually offered for sale in wicker cages, made of slit bamboo, but so wide are the bars, that as prisons for these animals they are utterly useless, for besides the property for which they are proverbial, these strange creatures are so peculiarly constructed that they can change their shape as readily as their colour; and a chameleon that might one moment seem to be in such good condition as to be looked upon as one of the "bloated aristocrats" of its species, would, before you could have well turned round, by the mere act of volition, be changed into the most miserable, half-starved, discontented democrat, that ever disgraced a community of lizards. To prevent the animals escaping, a very cruel practice is resorted to. They are tied by the hind legs and lower part of the spine to the cage. But despite their usual inactivity, so great is the love of freedom which even these humble reptiles possess, that they pull at the string which confines them with a high-souled perseverance that ought to ensure them a better fate. Their actual fate is, that the cord gradually cuts through the scales which protect their flesh, mortification sets in, and almost invariably ends in their death, either before or soon after they reach England. You may see the marks of this kind of treatment on the chameleon before you, and the injury it received in that way is the only cause I have to fear it will not survive through the ensuing winter. The day before leaving Alexandria, I

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bought two chameleons. As many will be curious to know the cost, I may mention, that after a deal of hard bargaining, the "upset price" being five shillings a piece, I obtained them, including one of the cages already described, for 1s. 6d. After the money had been paid, and I was felicitating myself upon the acquirement of a remarkably cheap lot, the chameleon merchant told me confidentially, that a short time before, when there was a glut upon the market, he had been selling them at two a penny! I took my purchases on board the vessel, well secured in the orthodox manner, and next morning found that one of them, in trying to escape from the terrible string, had died, with its head half through the bars of the cage. The other, with wonderful strength for so small a creature, had actually broken the string, and escaped to a little distance, and so lived. The survivor was christened Charley. After getting comfortably settled in his new quarters, near the stern windows, Charley seemed to find the fresh air of the Mediterranean agree with him, for he proved himself an excellent sharpshooter with his long tongue, picking off, with commendable avidity, all the flies that came within range; and his appetite had this advantage, which unfortunately I could not boast of — that it was not upon any occasion interfered with by sea sickness. The only thing that troubled him, was an affection of the skin, and one leg appeared to be, if not exactly dropping off, rapidly drying up. But nothing affected his appetite, and though the captain of the steamer prophesied every day, for a week, that he would never reach England alive, I am glad to say we landed together in Liverpool on the first of September. His general colour was yellower than the common tint — a sure sign of sickness, as I have since observed in other specimens. This condition, however, only made his changes of colour more remarkable and

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beautiful when they did occur. The little animal assumed a variety of colours and patterns—in which black, white, drab, and yellow were the component parts—such as I have never seen equalled by other specimens. I took to doctoring Charley, whose sores were sometimes so virulent as to bleed. When flies were exhausted, I sought the advice of the curator of the Royal Zoological Society, and at his suggestion, Charley was fed on small pieces of raw meat, to which were added crumbs of bread, soaked in tea, milk, or cocoa. Sometimes we fancied that Charley was beginning to repay all these attentions by becoming tame enough to answer to his name, and come across the table when whistled or called. But in general he was rather an ill-conditioned fellow, whose temper appeared to be soured by separation from his home and family; for he would frequently crawl about the kitchen or parlour floors, hissing and snapping his jaws at any of the fair sex who might happen to pass rather nearer to him than his dignity allowed him to brook quietly. One of his tricks, when in these humours, will scarcely be credited; but what I am about to tell is the simple fact. His left hind leg, which had been first sore, had gradually shrivelled up to the first joint, and become quite lifeless. One night I was removing him from the cage for the purpose of feeding, when he snapped and hissed in a terrible temper, and turning round, as if to lay hold of my fingers that held him, he got his jaws entangled with his useless leg, which he snapped off without the least ceremony. This feat—though I was accustomed to his freaks—so astonished me, that I involuntarily dropped him in alarm. The pain he seemed to suffer was intense, and he raced about with unusual activity. One day in October, during the absence of the family, Charley got astray, and as the night was very cold and wet, it was thought that he must have died;

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but, next morning, about eleven o'clock, he was found in the front garden, sitting very composedly on a ranunculus plant, still alive, though evidently much injured by being trodden upon. He lived, however, until the middle of November, and died of mortification, which commenced at the extreme tip of the tail, travelled during two or three days upwards to the head, when poor Charley died with struggles, which were a horrible parody on the last hours of those human beings who are said to "die hard."

In the autumn of the present year the same captain I had been with obtained for me five chameleons. They were "fresh caught," by a donkey boy at Rhamley, a sandy village five miles from Alexandria, where prosperous merchants plant their country houses. One of these cast his skin during the voyage, and died a few days after the steamer arrived here; another was taken by a gentleman to Port Glasgow, where it died in two days; another crept through an open side-port window and was drowned in the dock, and the remaining two I received on the 1st of September, twelve months after Charley's arrival in England. In honour of their Egyptian associations they were named Isis and Osiris. This one is Isis. They have both a singular history of their own. Favoured by the fine warm weather of this fall, they were very healthy and lively, and most industrious fly-catchers. On the afternoon of Sunday, 12th September, Osiris being left in the back garden while I took a stroll in the country, accompanied by a young friend who carried Isis about with him for the astonishment of the rustics, he managed to creep off unseen, and his loss not being observed for two or three hours, a most careful search among plants, and in walls covered with ivy, failed to discover him. As the nights were sharp and frosty, though the days were pleasantly warm, Osiris was given up as a likely victim of the English climate. All

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the more reason, therefore, for taking good care of Isis. Aware of the roving propensities of these apparently sluggish creatures, I had previously ordered a box to be made for their safe keeping, and showed the joiner what kind of animals were to be put into it. A week after, the box came home — a most complete apparatus, as all thought, with a glass window in the side, a sliding door at one end, and a boxed-off chamber at the other, for a bottle of hot water to stand in, when it began to be cold at night. There were moveable perches, too, for inmates of prehensile habits to hang on when asleep. On Monday, the 20th September, that precious box came home, but as it smelt strongly of putty and turpentine, it was thought necessary, to avoid poisoning Isis, to expose his future habitation to the sun and air before putting him into it. Unfortunately on that day too, Isis was lost. The little animal must have fallen (there was no chance of creeping down) from a chiffonier nearly five feet high on to a flagged floor, then crept through two kitchens, and up a flight of high stone steps into the garden. Chameleons, it may be remarked, are almost insensible to injury by falling from any moderate height, however hard may be the substance on which they alight. Isis was lost, and his temple tenantless. And here comes an incident which will gratify the lovers of the marvellous. On the Wednesday following this Monday of disasters, about noon, the joiner who had constructed the disused temple came to the house, bearing in his hand the lost Osiris. He had found him in a hedge by the roadside, surrounded by a crowd of men and boys, who were doing their best to stone to death that which appeared in their eyes a shocking monster. He had received an ugly blow at the end of the back, and remained sensitive to pain on being touched there. Joy was now restored to the household;

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the disused temple was brought out, and Osiris duly installed: he was supplied with a batch of flies daily, hot-bottled nightly, and placed in the warmest corner of the kitchen. The slide-door was seldom opened, except for a very small distance, in order that no cold air might strike death into his tender limbs. The result of all this careful nursing was, that Osiris died October 21st, exactly four weeks after his restoration, solely for want of fresh air; without which these animals, as I have since learnt, cannot live. Once more the temple was deserted, and the death of Isis mourned as antecedent to that of Osiris. Not so, though. A fortnight ago (Nov. 1st), on going home I found Isis in possession of the temple at the fireside. A schoolboy had picked the animal off a blackberry bush by the roadside that morning (not far from where Osiris was found), and a passing rogue had, under pretence of kindness, robbed him of Isis, who was immediately sold at the nearest public-house for three pints of ale. His six weeks of country life — during which there were nights of positive frost, several days of bitterly cold rain, and a continuance of raw easterly winds — had left him in excellent plump condition of body, but rather drowsy from the effects of cold. The days of Isis are now passed happily on a myrtle-tree, placed on the parlour mantlepiece, and his nights in peace in the temple, which is now thoroughly ventilated.* For myself, I have never tired watching his curious ways, which help me to reflect how wonderful are the works, how minute and perfect the conceptions, of the master mind that created alike the little chameleon and the great globe of which it is so singular an inhabitant.

* Early in December, the Secretary received notice of the death of Isis.

Erratum — *For* Rhamley *read* Rham-el-lay.

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Mr. C. Bell entered into some details respecting the exploring expeditions of Mr. Gregory and Mr. Babbage into the interior of Australia, and the important geological speculations which arise therefrom.

The following paper was then read —

ON THE USEFUL PRODUCTS OF THE UMBELLIFERÆ.*

By THOMAS C. ARCHER, Esq., V.P.
PROFESSOR OF BOTANY, QUEEN'S COLLEGE, LIVERPOOL.

This most remarkable order is of great interest to the botanist; for notwithstanding its prominent characters, which constitute it the most clearly marked natural order of the vegetable kingdom, its properties are probably more miscellaneous and opposite than those of any other order. From it we obtain none of those extensively useful products which constitute the staple articles of commerce, yet amongst its numerous species we find a great number which minister to the wants of man.

By far the greater proportion of those which come under our notice are valued for their medicinal properties, which give some a place in our pharmacopœias, and still more in the stock of the herbalist. Many are deadly poisons, others wholesome and nutritious vegetables. The fruits of nearly all are free from poisonous qualities, and those which are furnished with *vittæ* usually yield essential oils highly aromatic, and generally agreeable. The stems and roots of many yield aromatic gum-resins; and the poisonous principles usually exist in the foliage, stems, and roots of those which grow naturally in damp situations. Indeed, one of the most remarkable points in the history of this order, is the fact, that dryness and dampness exercise so remarkable an effect upon the

* The native names have been abbreviated thus — *Jap.* Japanese. *Jav.* Javanese. *Ben.* Bengalese. *Tam.* Tamoolie. *Tel.* Telingoo. *Cing.* Cingalese. *Sans.* Sanscrit. *Fr.* French. *Ger.* German. *It.* Italian. *Dut.* Dutch. *Span.* Spanish.

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species, that some grown in damp situations are deadly poisons, but removed and cultivated in dry soil, become innocuous.

The general characters of the UMBELLIFERÆ are—CALYX tubular, or lower portion adherent to the ovary; the upper portion or limb either entire, five-toothed, or obsolete. COROLLA consisting of five petals inserted into the upper part of the calyx, and usually curved inwards at their points; œstivation imbricate, sometimes, though rarely, valvate. STAMENS five, alternating with the petals and incurved in æstivation. OVARY inferior and adherent to the interior of the calyx-tube, usually two-celled, but very rarely one-celled, each containing a single pendulous ovule. STYLES two, distinct, but thickened at their bases into enlargements called *stylopodia*, which cover the ovarium. STIGMAS simple. FRUIT a *cremocarp* consisting of two *mericarps*, adhering by their faces to a common axis, from which, when ripe, they readily separate; the outward surface of each mericarp traversed with perpendicular ridges, of which there are two series—five, being more distinct are termed the primary ribs *(costæ seu juga primaria)*, and four less strongly marked and sometimes absent called the secondary ribs *(juga secundaria)*; in the channels between these ridges and beneath the pericarp, small longitudinal oil vessels, termed *vittæ* are formed in some species. SEED pendulous, almost invariably adhering to the pericarp. EMBRYO minute and pendulous. RADICLE pointing to the hilum. ALBUMEN abundant and horny. PLANT herbaceous, with hollow furrowed stems. LEAVES usually divided, sometimes simple and sheathing at the base. FLOWERS white, pink, yellow, or blue, arranged in umbels, generally surrounded by an involucre.

The following sub-division of the Umbelliferæ was made by De Candolle, and is here adopted as the most

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convenient arrangement, such tribes being omitted in the details as contain no species of economic value :—*

SUB-ORDER I. ORTHOSPERMÆ — Albumen flat or flattish inside, neither involute nor convolute.

TRIBES.

1. Hydrocotyleæ.	7. Peucedaneæ.
*2. Mulineæ.	*8. Tordylineæ.
3. Saniculeæ.	9. Silerineæ.
4. Ammineæ.	10. Cumineæ.
5. Seselineæ.	11. Thapsiceæ.
6. Angeliceæ.	12. Daucineæ.

SUB-ORDER II. CAMPYLOSPERMÆ — Albumen involute, or marked by a longitudinal furrow on the inner side.

TRIBES.

*13. Elæoselineæ.	15. Scandicineæ.
*14. Caucalineæ.	16. Smyrneæ.

SUB-ORDER III. CÆLOSPERMÆ—Albumen involutely curved from the base to the apex.

TRIBE.

17. Coriandreæ.

TRIBE I. HYDROCOTYLEÆ.

GENUS HYDROCOTYLE. (L.) Penny-wort.

Only two species of this genus, both perennial herbs have been employed :—

H. Asiatica (Thumb.), Asiatic Penny-wort; called Sakusets and Kakidoro (Jap.), Panggaga (Jav.), Thallkuri (Ben.), Vullarei (Tam.), Babassa (Tam. and Tel.), Heengotu-kola (Cing.), *Manduka-parni* (Sans.) Though bitter, the leaves of this plant are cooked and eaten as a culinary vegetable in India. It is also employed in several countries as a medicine : in the East Indies an infusion

* Marked with an asterisk.

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of the dried leaves is given to children, as a remedy in cases of fever and diarrhœa; for this purpose it is usually combined with fenngreek seeds. The Javanese doctors value it highly as a diuretic; and the natives of the coast of Coromandel apply the leaves to bruises to prevent inflammation. It is a native of the whole southern hemisphere.

H. umbellata (L.) is a native of the West Indies and various parts of North and South America, and is employed in those localities in the cure of hypochondria, its virtue being dependant upon its aromatic juice.

Genus AZORELLA. (Gaud.) Azorella.

The only species having any known use is —

A. Gilliesii (Hook. and Arn. in "Bot. Miscellany") is a native of the valley of Uspallata, on the Chilian Andes, at an elevation of 6000 to 12,000 feet. It yields an abundance of aromatic gum-resin, which is in much repute with the natives of those elevated regions for the cure of headache. It is a herbaceous perennial of small size.

Tribe III. SANICULEÆ. (L.)

Genus SANICULA. (L.) Sanicula.

S. Marylandica (L.) The Maryland sanicle. A perennial herb, native of a considerable portion of North America and of Newfoundland. Under the name of black sanicle root, it is prepared by the Society of Shakers, at New Lebanon, in the United States, and sold as a tonic, astringent, and diuretic medicine.

S. Europœa (L.) European sanicle. A perennial herb, formerly having great reputation as a healing herb, applied in the form of poultice; it has, however, long ceased to be used in regular pharmacy, and is only rarely employed by the herbalists.

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GENUS ASTRANTIA. (De C.) Masterwort.

A. major (L.) The larger masterwort. A perennial herb, native of the greater part of Europe. Some continental practitioners have used the roots as a purgative medicine, and also those of the following —

A. minor (L.), the smaller masterwort, which is a native of the Alps, Germany, France, Italy, &c., as a cure for cancer and remedy for insanity.

GENUS ERYNGIUM. (L.) The Eryngo.

Plants of this genus have long enjoyed a high repute. Dioscorides speaks of a plant as a specific for all diseases arising from flatulence, which is supposed to have been a species of Eryngo, whence the generic name, which is derived from ερευγω I belch.

Pliny also says, "In the first rank of the plants armed with prickles the *Eryngo* stands pre-eminent, a vegetable production held in high esteem as an antidote, formed for the poison of serpents and all venomous substances." He further says, "It is cultivated in gardens, but it is frequently to be found growing spontaneously in rugged and craggy localities. It grows, too, on the seashore." This would seem to refer to our *E. maritimum*. He speaks of another, which he says was called "Centum capita," having all the properties of the above, and which the Greeks employ as an esculent vegetable, eating both stalk and root, either raw or boiled. He further remarks, "There are some marvellous facts related in connection with this plant: the root of it is said to bear a strong resemblance to the organs of either sex. It is but rarely found; but if a root resembling the male organs should fall in the way of a man, it will insure him woman's love; hence it is that Phaon, the Lesbian was so passionately beloved by Sappho. Upon this subject, too,

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there have been numerous other reveries, not only on the part of the Magi, but of Pythagorean philosophers even as well." To this he appends a long list of its curative powers, showing it to have been an important article in the ancient *Materia Medica* (Bohn's Edition, B. xxii. Chaps. 8 and 9). The aphrodisiac properties attributed to this root by the ancients have been handed down to modern times; the roots of both species, *E. campestre* and *E. maritimum*, having still a high repute amongst the Turks of the present day. Shakspeare knew it well, and made Falstaff exclaim —

"Hail, kissing-comfits and snow eringoes."

The species of Eryngium now in use are —

E. maritimum (L.) The sea eryngo and sea-holly. A herbaceous perennial, very plentiful on the sandy shores of Europe. In Sweden and in Crete the young shoots are boiled and eaten as asparagus, and are said to be very nourishing and agreeable. As a medicinal plant the Eryngo root is still esteemed by the country people, and when candied is considered a powerful restorative. "Candied Eryngo root was first made in England, at Colchester, about the beginning of the seventeenth century, by Robert Buxton, an apothecary. His apprentice, Samuel Great, continued this business, and it has ever since been carried on by the posterity of the latter." (Morant's Colchester.) The root has a sweet aromatic taste, and so also have the leaves and stems.

E. campestre (L.) The field eryngo. The roots and foliage of this plant possess all the properties of the sea-holly, and are frequently confounded with it. It is rare in England, but is plentiful in the sandy fields of middle and southern Europe. Its habits are similar to *E. maritimum*.

E. fœtidum (L.) Fetid eryngo. A herbaceous perennial, common in the island of Jamaica, and in Brazil and Guiana. It is called Fitweed by the poorer classes, who

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employ it for the cure of hysteria and other nervous diseases. It is used in infusions and decoctions of the whole plant.

E. aquaticum (L.) Aquatic eryngo. A perennial plant, widely distributed in marshy places of both North and South America. It is erroneously called Button-snake-weed by Mr. Redwood. The plant known by that name in American pharmacy is *Liatris spicata*, one of the Compositæ. The root of the aquatic eryngo is employed in North America as a specific for the bite of the Rattle-snake, whence it is generally known in that country as the Rattle-snake weed.

E. tricuspidatum (L.) The tricuspidate eryngo. Is a native of the South of Europe, where it is found growing in cultivated fields. The young shoots are dressed like asparagus, and are considered an agreeable and wholesome esculent vegetable.

Tribe IV. AMMINEÆ.

Genus CICUTA. (L.) Water Hemlock.

C. virosa (L.) The poisonous water hemlock. This dangerous plant is a native of England but is not common; it is, however, abundant in the lakes, rivers, and ditches of Northern Europe and North America. It has been used with good effect in the form of poultices, applied to cancerous and scrofulous tumours; its juice is also occasionally applied, and has a powerful anodyne effect.

C. maculata. (L.) Spotted-stemmed cowbane. A native of the colder parts of North America, growing in damp woody places. Like *C. virosa* it is a deadly poison, particularly its root; but the plant has been found useful as an anodyne poultice, and has been employed as a substitute for the common hemlock.

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Genus APIUM. (L.) Celery.

A. graveolens (L.) Called in its wild state smallage, but when cultivated is better known as celery. This plant has a wide geographical range, being a native of almost the whole of Europe. It has also been found in the Falkland Islands and on the Chilian Andes, about Mendoza. It is also stated that it exists in large quantities in the southern states of America, and that the celebrated Canvas-back ducks, the great ornithological delicacy of the United States, derive their peculiar flavour from feeding upon it; this, however, requires confirmation. In Europe it is now cultivated to a great extent, and is one of the most esteemed of our salad herbs. Though very poisonous in its wild state, it becomes perfectly wholesome by cultivation, and when blanched by the process of "earthing up," it loses its peculiar and disagreeable flavour, and acquires a delicate and nut-like sweetness. There are a great many varieties in cultivation, which may be ranged under three divisions, the red, the white, and the turnip-rooted. The last is the Celeriac of English gardeners, who, however, rarely cultivate it. Owing to its greater hardiness it is a favourite with the German and French gardeners, by the former of whom it is called knott-cellerie, and by the latter celeri-rave. The fruit, which contains an agreeable essential oil, is used to flavour soups, &c.

Genus PETROSELINUM. (Hoffman.) Parsley.

P. sativum (Hoffm. and Kock.) *Apium petroselinum* (L.) The common parsley of our gardens is now so generally cultivated that it has become naturalised, and appears as a wild plant in many places. Its native habitats, however, are Sardinia, the Greek Archipelago, Turkey, and in Chili, growing on the rocks near Concepcion. The

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fruit, though quite innocuous to other animals, is said to be a certain poison to parrots. There are three varieties in cultivation —

1. The *common plain leaved* or true species.

2. The *curled leaved.*— *P. sativum*, *P. crispum* (De C.): the one most generally cultivated as a pot-herb and for garnishing dishes, for which purpose it is admirably adapted on account of its crisply curled and beautifully green leaves. This variety was known to the ancients, and in Achaia was used to form the wreath which graced the victor in the sacred Nemean games. Pliny states, that before sowing the seed it was slightly bruised in a mortar, to insure the plants being more crisped, or else it was trodden or rolled when sown.

3. The *broad-leaved* or *large-rooted Hamburgh.*— *P. sativum*, var. *latifolium*. This is cultivated for its large parsnip-like roots, which are by many esteemed as an agreeable vegetable when boiled. The roots are also sold by the herbalists as a remedy for gravel and other disorders.

P. segetum (Koch.) The common honewort. An annual species, native of the middle parts of Europe. It is occasionally used as a domestic remedy, in the form of poultice, for reducing sluggish swellings. It is called honewort, from its former use in curing a swelling in the cheek, called a *hone*.

Genus HELOSCIADIUM. (Koch.)

Creeping Water-Parsnip.

H. nodiflorum (Koch.) Knot-flowered Helosciadium. A perennial plant, very common in rivulets and ditches in Britain and other parts of Europe, frequently growing with and mistaken for water-cress, from which, however, it may be readily distinguished by its sheathing petioles. It formerly held a place in the London Pharmacopœia

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as an antiscorbutic remedy, and Dr. Withering asserted that the juice, taken two or three times a day, in doses of three teaspoonsful, had singular efficacy in curing cutaneous eruptions.

Genus PTYCHOTIS. (Koch.) Ptychotis.

P. ajowan (De C.) The Ajowan ptychotis. An annual plant, a native of India, where it is extensively cultivated for its aromatic fruit, which is used as a condiment under various names, as *Ajowan, Ajowain, Arub-ujwain, Ujmood, Nan Khooah;* in Scinde it is called *Wull Tan.* The fruit resembles that of the common caraway in colour, but is shorter and thicker. The essential oil of the fruit is so remarkably like oil of thyme in smell and taste, that some importations of ajowan seed have arrived, for the purpose of distilling the oil. "The fruit is used also as an aromatic in colic and in veterinary pharmacy." (Ainslie).

Genus SISON. (De Cand.) Stone Parsley.

Sison amomum (Lin.), *Sium aromaticum* (Lam.), *Seseli amomum* (Scop.), *Cicuta amomum* (Crantz.), *Smyrnium heterophyllum* (Mœnch.) Ammomum, or ginger-seeded stone parsley. A native of Great Britain and Europe generally. It was formerly much in favour as a warm aromatic medicine, and formed part of the once popular compound called Venice treacle, and was known in the shops under the name of *Semen amomi.*

Genus AMMI. (L.) Bishop's-weed.

A. visnaga (Lam.) The tooth-pick Bishop's-weed. A large annual plant, very widely distributed. It is a native of Southern Europe, Northern Africa, the plains bordering on the Caspian Sea, and in South America on the Chilian Andes. The rays of the umbel are very

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numerous, and about two inches in length; when the fruit is ripe the rays become very hard and tough, and are collected, tied into bundles, and sold on the Continent as tooth-picks. In Spain they are also chewed, it being supposed that they conduce to the firmness and healthiness of the gums. The plant is known in France under the name of *herbe aux cure-dents*. Its specific name *visnaga*, signifies a tooth-pick. Good illustrations of the plant and its applications are in the museum of Economic Botany at Kew.

Genus ÆGOPODIUM. (L.) Gout-Weed.

Æ. podagraria (L.). The gout-weed is a perennial herb, and native of the whole of Europe. Its name is derived from the use to which the Germans formerly applied it, namely, assuaging the pain of gout and hemorrhoids. It is now never used medicinally, but its leaves are used in salads, and the plant, when young and tender, is boiled and eaten as a vegetable in Sweden.

Genus CARUM. (Koch.) Caraway.

C. carui. (L.) The common caraway is a perennial plant said to have come originally from Caria, in Asia Minor, whence its name; but it is now found, either native or naturalised, through the greater part of Europe. It was cultivated in the time of Pliny; but it was also imported, as he says, "The best is that, however, which comes from Caria, and the next best is that from Phrygia." It is now largely cultivated in Germany and in Holland, and the fruit is imported in considerable quantities into this country: 12,485 cwts. were imported in 1857. It enters slightly into medicinal preparations, chiefly as a warm stomachic, for which purpose its essential oil is generally employed; but its principal consumption is by the confectioners and makers of cordials and liqueurs.

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C. nigrum (Lindl. in "Med. Bot.") Black caraway. A native of India, where it is known by the names *Kumoon* and *Zeera seeah*, and is used as a carminative medicine.

C. bulbocastanum (De C.), *Bunium bulbocastanum* (L.) The earth-nut. This small umbellifer is one of the most common in our pastures in many parts of England; it is also abundant all through the west and south of Europe. In this country the tubers, which are about the size of a common hazel nut, round and dark-coloured externally, fleshy and white internally, with a somewhat agreeable aromatic, sweet taste, are known under many names, as *earth-nut, pig-nut, earth-chestnut, ground-nut, jur-nut, yer-nut, hawk-nut, ar-nut, and kipper-nut.* Names of similar meaning are also used in other countries, as *Erdnuss* in Germany, *Aardnoot* in Holland, *Jordnot* in Sweden, *Terre-noix* and *Suron* in France, *Castagna de terra* in Italy, and *Castano de tierra* in Spain. In times of scarcity they have been collected and used for food; in this country they are eagerly sought after by children, who seem fond of them; but their wholesomeness in a raw state is very questionable, as notwithstanding their sweet nut-like flavour, there is a certain amount of acridity about them. This, however, is dispelled by roasting or boiling, in which state they are even preferred to chestnuts, and are so eaten in Holland and other continental countries. In England they are occasionally used in soups, and are considered very nutritious. Notwithstanding the great abundance of the plant in localities where it is found, the collection of the roots is difficult, owing to the external colour being the same as that of the soil.

Genus BUNIUM. (Koch.) Earth-nut.

B. ferulaceum (Smith.), *B. ferulæfolium* (Delf.), *Sium ferulæfolium* (Spreng.), *Topana* (Greece). Ferula-leaved earth-nut. A native of the islands of Cyprus, Scio, and

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Candia, where the tuberous roots are collected and eaten by the natives, under the name of Topana. They are used raw, or are roasted or boiled.

GENUS PIMPINELLA. (L.) Burnet-saxifrage.

P. magna (L.). The large Burnet-saxifrage is a herbaceous perennial plant, native of the whole of Europe and some parts of Northern Asia. It is used in Germany as a medicinal plant in various ways. The root is dried, and from it is obtained a blue oil, which is very acrid, and is used as a cure for the tooth-ache and sun-freckles. The root is chewed to excite the flow of saliva; it is also employed in the cure of asthma and dropsy, and is added to gargles to dissolve the viscous mucous of the throat.

P. anisum (L.). The Aniseed plant. An annual plant, a native of Egypt and Greece, now cultivated in the south of Europe and India. It has been held in esteem as a useful aromatic, from very early times; it was used by Hippocrates; Pliny says it was commended by Pythagoras, and was used in sixty-one remedies, "taken in wine, either raw or boiled," it cured the stings of scorpions. Both green and dried it is held in high repute as an ingredient in all seasonings and sauces, and we find it placed underneath the crust of bread. Put with bitter almonds into the cloth strainers for filtering wine, it imparts an agreeable flavour to the wine. It has the effect also of sweetening the breath and removing all bad odours, if chewed in the morning with *smyrnion (Smyrnium olusatrum)* (L.), and a little honey, the mouth being then rinsed with wine.

"This plant was supposed by Pliny to impart a youthful look to the features, and if suspended to the pillow, so as to be smelt by a person sleeping, to prevent all disagreeable dreams. It has the effect of promoting the appetite; for this, too, has been made by

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luxury one of the objects of art ever since labour has ceased to stimulate it. It is for these various reasons it has received the name of *anicetum* (unconquerable, from the Greek α not, νικάω I conquer.—Pliny's Nat. Hist., Bohn's edition). The same name, *anicetum*, was applied by Dioscorides to Dill, *Anethum graveolens*. The reference to anise in the New Testament (Matthew xxiii. 23) "For ye pay tithe of mint, and *anise*, and cummin," is supposed to be a mis-translation, and that dill is referred to instead of anise.

At present its virtues are neither so numerous nor extraordinary as those imputed to it by Pliny; but its essential oil, distilled from the fruit, is esteemed a valuable aromatic stimulant, and enters into several preparations ordered by our pharmacopœia. The oil is largely imported from China and Germany; much of that from China and India is probably distilled from the magnoliaceous plant *Illicium anisatum*, but the real oil of Anise is solid at 50° F., whereas the oil of Illicium or Star-anise is fluid at 35·6°. It is principally cultivated in Malta and Spain, and it is from these countries and Italy we chiefly import the fruit. The foliage is esteemed as a garnish, and in sauces in the same way as fennel, for which purposes it is sometimes cultivated in this country.

GENUS SIUM. (Koch.) Water-Parsnip.

Sium sisarum (L.), *Chevis*. (Fr.), *Zuckerwurzel* (Ger.), *Sisaro* (It.) The Skirret. This plant is a native of China, Japan, and other parts of Asia, but has long been cultivated as a culinary vegetable, the root being the part used; formerly it was much esteemed and is still a favourite delicacy with some persons. The root is a bundle of spindle-shaped fibres, which, under good cultivation, become each the size of one's finger; they are boiled and eaten with melted butter. In Scotland they

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are called *Crummocks*, and are frequently cultivated in the northern parts. It was described by Worlidge, a writer in 1682, as "the sweetest, whitest, and most pleasant of roots."

There is an exotic variety called *Ninsi*, which is also cultivated. Both kinds have a medicinal reputation in Asia, where the leaves are reputed diuretic and anti-scorbutic, and the roots aphrodisiac and tending to lengthen life. They are sometimes confounded with *Ginseng*.

Genus BUPLEURUM. (Tourn.) Hare's-ear.

B. rotundifolium (Lin.), *B. perfoliatum* (Lam.). Round-leaved Hare's-ear, or thorow-wax. Native of England and Europe generally. The entire, oval, perfoliate leaves of this plant were formerly employed in medicine as a vulnerary and aperitive, also as a diuretic. The leaves were made into a poultice, and applied to tumours and other similar external affections; but the plant is unknown in modern pharmacy.

Tribe V. SESELINEÆ.

Genus LICHTENSTEINIA. (De Cand.)

L. pyrethrifolia (Chamisso.), *Bubon proliferum* (Barm.), *Œnanthe inebrians* (Thumb.), *Œnanthi capensis* (Houtt.). Pyrethrum-leaved Lichtensteinia. The *Gli* of the Hottentots, who make from the plant an intoxicating liquor.

Genus ŒNANTHE. (Lam.) Water-Dropwort.

Œ. crocata (Lin.). Saffron-coloured juiced water-dropwort. This common European plant, growing always in watery places, is a most dangerous poison; it is, however, frequently used in country practice, chiefly as an

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external application in the form of poultice. In Ireland it is known under the name of *Tahow.*

Œ. phellandrium (Lam.), *Phellandrium aquaticum* (Lin.), *Ligusticum phellandrium* (Crantz.), *Cicutaria palustris* (Gerard.) The Phellandrium or water-leaved dropwort. A native of Britain and Northern Europe. Its leaves are collected by herbalists, and formerly were much employed in cataplasms, and were considered powerfully discutient: the seeds, too, were employed internally, as diuretic and expectorant, and many virtues have been imputed to all parts of the plant.

GENUS FŒNICULUM. (Adamson.) Common Fennel.

F. vulgare (Ray.), *Anethum fœniculum* (Lin.), *Meum fœniculum, var a.* (Sprengel.), *L. Aneth.* (Fr.), *Dillkrant* (Ger.), *Dille* (Dut.), *Aneto* (It.), *Eneldo* (Span.), The common fennel is a native of Britain, and found wild in many parts of Europe. It has been regarded as a useful plant from very early times. The ancients believed it to be beneficial to the eyes, the knowledge of which virtue Pliny tells us was learned from the serpent, which, he says, tastes the fennel plant when its eyes are weak, at the time of casting its skin, for the purpose of sharpening its sight. He also speaks of a gummy exudation from the stem which was collected in Iberia, and was much esteemed in medicine. Its modern uses as an ingredient in sauces and salads are well known. Its fruit and its essential oil are both employed in pharmacy as aromatic stimulants. It is said to grow in great abundance in the woods on the Brazilian coast (probably introduced from Europe), and is there used to brush out the rooms, as it is said, to sweeten them and drive away vermin.

F. dulce (Bauhin.), *Anethum dulce* (De Cand.), *Finnochio dulce* (Targioni), *Finnochio* (It.). Sweet fennel.

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A native of Italy and Portugal, where it is largely cultivated, and used somewhat as we use celery; the young stems, which are blanched, as they grow, by earthing up the soil upon them, are eaten with oil, pepper, and vinegar, and are considered very wholesome and agreeable. Finnochio is sometimes grown in this country. Its seed or fruit, and the essential oil distilled from it, find a place in our pharmacopœias, but are rarely used. Their warm stimulant properties lead to their employment in the flatulent colic of infants.

F. panmorium (De Cand.), *Anethum panmorium* (Roxb.), Panmuhoorie Fennel. An East Indian species, which is cultivated in that country, and employed in the same manner as the common fennel here.

F. Capénse (De Cand.), *Anethum fœniculum* (Thunb.), *Anethum Capénse* (Thunb. in *Flor. Cap.*). Cape Fennel. A native of the Cape of Good Hope, where its roots are sometimes eaten. But little, however, is known of its history.

Genus SESELI. (De Cand.)

S. montanum. Mountain Meadow-Saxifrage. A native of Europe from France to Tauria, growing on high lands. Its roots are occasionally used on the continent as a purgative medicine, but have no great repute.

S. tortuosum (Lin.), *Sium tortuosum* (Roth. and Bauh.). Twisted Meadow-Saxifrage. A native of many parts of Europe, especially about Constantinople. The seeds are used as a stomachic and aperitive medicine, and the roots are employed in the cure of asthmatic and bronchitic affections, chiefly by the Turkish doctors.

Genus LIBANOTIS. (Crautz.)

L. vulgaris (De C.), *Athamanta libanotis* (Lin.), *Seseli libanotis* (Koch.), *L. daucöides* (Scop.), *L. montana* (All.),

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Athamanta oreoselinum (Hud.). *Ligusticum ferulaceum* (Lapezr.). Libanotus or mountain stone-parsley, or black gentian. This plant is a native of Britain, and has been occasionally used as a remedy for calculus in the bladder. It is considered diuretic and diaphoretic.

GENUS ATHAMANTA. (De Cand.)

A. Macedonica (Spreng.), *Bubon Macedonicum* (Lin.), *Daucus Macedonicus* (Riv.), *Apium Macedonicum* (Moris.). Macedonian parsley or spignel. A native of Macedonia and some parts of Italy. It was one of the ingredients of the celebrated Venice treacle of the old pharmacopœias. The whole plant has a powerful fennel-like odour, and is used in the East to perfume clothes, and the seeds are employed as a diuretic and emenagogue medicine.

A. Cretensis (Lin.). There are two varieties of this plant: var. α *hirsuta* (De Cand.) is the *Libanotis hirsuta* (Lam.), *Athamanta Cretensis* (Jacquin), and *Daucus Creticus* (Cam. epit. 536).

Var. β *mutellinoides* (De Cand.) is *Athaneta mutellinoides* (Lam.), *Athamanta Mathiola* (De C. fl. fr. p. 318), *Athamanta rupestris* (Vill.), *Aathamnta annua* (Lin.). The Cretan spignel, or candy carrot, or carrot of Crete. This plant, a native of the high lands of Southern Europe, was also one of those the seeds of which were employed in the composition of the once famous Theriaca Andromachi, called also Venice or London treacle, and the Confectio Mithridatum or Damocratis, both of which have been expunged from our pharmacopœias since 1746. The seeds are still employed, occasionally, by the continental herbalists as aromatic and carminative remedies.

A. mathiola (Wulf.), *Libanotis* (Scop.), *Meum mathiola* (Bauh.). Mathioli's spignel. Native on the Carinthian Alps and Carniola. The roots are used in the countries

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where they grow as a drastic purgative and emetic, but form a dangerous medicine from the extreme violence of its action.

Genus LIGUSTICUM. (De Cand.)

L. Scóticum (Lin.), *Angelica Scótica* (Lam.), *Seseli Scóticum* (Riv.), *Apium ternatum* (Willd.). Scotch Lovage. Native of countries extending from the North of England to Kamschatka. Its roots are eaten either raw or boiled, and are liked by those who are used to them, but it is not always easy to acquire a taste for their very acrid Angelica-like flavour.

Genus SILANS. (De Cand.)

S. pratensis (Bess.), *Peucedanum silans* (Lin. and Smith's Engl. Bot., 2142), *Cnidium silans* (Spreng.), *Sium silans* (Roth.), *Seseli praténse* (Riv.), *Seseli selinoides* (Jacq.), *Ligusticum silans* (Duby in De C. Bot. Gall.). Meadow Pepper-saxifrage. Native of Britain and the low lands of Northern Europe. The roots of this plant have been employed in calculous affections.

Genus MEUM. (De Cand.)

Meum athamanticum (Jacq.), *Athamanthum meum* (Lin.), *Ligusticum capillaceum* (Lam.), *Ligusticum meum* (De. C.) *Daucus Creticus* (Trag.) Spiguel, Meu, or Bald-money. The Highland-miken of Scotland. This plant is abundant in the mountain pastures of most parts of Europe. It is the *Μεον αφαμαντικον* of Dioscorides and the *Meum Athamanticum* of the Romans. Pliny says the derivation of its specific name was a matter of dispute in his time, some asserting that it was given in consequence of the plant having been first discovered by Athamas, and others

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because the best quality was found on Mount Athamas. He further says, "the root of this plant, pounded or boiled and taken in water is diuretic, and is marvellously efficacious in expelling flatulency of the stomach. It is good, too, for gripings of the bowels and affections of the bladder." Its sweet aromatic roots were employed in later times in the Theriac compound or Venice treacle before alluded to, but at present it is not used unless by the herb doctors.

Genus CRITHMUM. (De Cand.)

Crithmum maritimum (Lin.), *Cachrys maritima* (Spreng.). (Fr.) *Saint-Pierre* and *Perce-pierre*, (Ger.) *Meerfeuche*, (It.) *Finnochio marina.* Common Samphire. Native of the shores of Europe as far north as Britain. Its thick, fleshy, and very tender leaves and stems have always formed a favourite pickle in this country; but it is not common, owing chiefly to the inaccessible nature of the places in which it usually grows. It loves to deck the sides of perpendicular cliffs, with bright patches of vegetation, which, from their peculiar golden green, appear like gems of chrysoprase set in the rocks. The familiar words of Shakespeare —

> "Half way down
> Hangs one who gathers samphire; dreadful trade!
> Methinks he seems no bigger than his head."

Show that it was in repute in his time, and that the demand for it was sufficient to induce men to risk their lives in procuring it. At present it is a rarity in the London markets, and is only commonly used in localities where it is easily procured. It has a warm aromatic taste, and is thought to be very wholesome. A Mr. Braddick cultivated it successfully in a prepared soil at Thames Ditton, near London, for several years.

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Tribe VI. ANGELICEÆ.

Genus LEVISTICUM. (De Cand.)

L. officinale (Koch.), *Ligusticum levisticum* (Lin.), *Angelica paludapifolia* (Lam.), *Angelica levisticum* (Allioni), *Levisticum vulgare* (Moris). Officinal or common lovage. The lovage is a native of the Pyrenees and many other parts of Europe; formerly, its qualities as a stomachic, and in relieving flatulency, hysteria, and uterine obstructions; and as a sudorific, caused it to be much valued, and it still finds a place in the domestic medicinal preparations of the Americans, for which purpose it is cultivated and prepared by the United Society of Shakers, at New Lebanon, State of New York. This remarkable sect, which has been famous for their careful preparation of medicinal plants, sell the dried leaves as carminative, stomachic, and emenagogue, and the seeds and root as diaphoretic carminative, and stomachic. The punctured stem yields a resinous juice, which, when collected, resembles opoponax, and was formerly sold as English opoponax. Probably it is the *Sacopenium* of Pliny, which grew and was collected in his time in Italy.

Genus SELINUM. (De Cand.)

S. caruifolium (Lin.), *S. pseudo-caruifolia* (Allioni), *S. angulatnm* (Lam.), *S. membranaceum* (Vill.), *Angelica caruifolia* (Spreng.), *Laserpitium selinoides, Mylinum caruifolium* (Gand.), *Carum pratense* (Park.), *Angelica tenuifolia* (Riv.), *Thysselinum palustre* (Vaill.). Caraway-leaved milk-parsley. This plant is a native of most parts of Europe, but not of Britain. It has been occasionally used as an antidote to poisons, although its utility is more than questionable.

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Genus ANGELICA.

A. sylvestris (Lin.), *Imperatòria sylvestris* (De Cand), *Selinum sylvestre* (Crantz.), *Selinum angelica* (Roth.), *Selinum pubescens* (Möench.). Wild Angelica. This is abundant in Britain and most parts of Europe. Its roots were formerly employed as a carminative medicine in lieu of the true Angelica Root, to which they are much inferior. The stalks and leaves have been occasionally used by dyers to produce a yellow colour.

Genus ARCHANGELICA. (De Cand.)

A. officinalis (Hoffm. and Koch.), *Angelica archangelica* (Lin.), *Angelica officinalis* (Möench.), *Angelica sativa* (Miller). *Angèlique* (Fr.), *Engelwürtz* (Ger.), *Engelwortel* (Dut.), *Angelica* (It. and Port.), *Anjeleica* (Span.). Officinal or garden Angelica. This plant is a native of Northern Europe; it is found in Britain occasionally, but its right to be considered a native is very doubtful. It is extensively cultivated for its young stems and leaf-stalks, which are candied by the confectioners, and really form a most agreeable sweetmeat, having a peculiar aromatic pungency, which is generally liked. The natives of Northern Europe, particularly the Russians and Laplanders, use it as food, especially the root, which they hold to be very wholesome, and to which they also attribute many medicinal virtues. They also use the seeds as aromatic carminatives, and in the same way employ an extract, formed by boiling a quantity of the flowers in milk until it becomes thick. The Laplanders believe it lengthens life, and chew it as they would tobacco; the Norwegians occasionally mix it with their bread; both these nations, and others, use the young stems, when blanched, as we do celery.

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A. atropurpurea (Hoffm.), *Angelica atropurpurea* (Lin.), *Angelica triquinata* (Bigelove). Dark purple-stemmed Angelica. Angelica of the Americans. Native of the warmer parts of the United States, where it is collected, and its leaves, root, and seeds, are employed as tonics and carminatives; they are amongst the *Materia Medica* of the United States Pharmacopœia.

A. Gmelini (De Cand.), *Angelica Gmelini* (Worrusk.), *Apium ternatum* (Pall.) Gmelin's Archangelica. Native of Kamstchatka, where, and in Russia, it is used as a culinary vegetable, in the same manner as *A. officinalis*, the young stems blanched being usually employed.

Tribe VII. PEUCEDANEÆ.

Genus OPOPONAX. (Koch.)

O. chironium (Koch), *Pastinaca opoponax* (Lin.), *Selinum opoponax* (Crantz.), *Ferula opoponax* (Spreng), *Pastinaca altissima* (Lam.). The Πανακες ηρακγειων of Dioscorides. *Opoponax* (Fr.), *Panax Gummi* (Ger.), *Opoponace* (It.), *Jawesheer* (Arab.), *Gawsheer* (Pers.) Common opoponax, or Chiron's opoponax. Native of the warmer parts of Europe, especially of Italy and Greece. The gum resin which oozes from the wounded roots and stems of this plant, has had a medicinal reputation from the remotest antiquity. It was employed by Hippocrates, Theophrastus, and Dioscorides. Pliny calls it "Panax," and says it is procured from Syria, the price in his time of the best quality being two denarii per pound. It was chiefly used in ointments, but its virtues were supposed to be so numerous, that it was called Opoponax, signifying "the juice, which is the universal remedy." The Opoponax of commerce, and of our pharmacopœians, is either in irregular yellowish-red lumps, or in reddish tears—the

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Opoponax in massis, and *O. in lachrymis* of pharmacologists. It has a fetid unpleasant odour, and an acrid disagreeable taste. The Arabian physicians occasionally employ the whole root externally.

It is remarkable, that a medicine like this should have so long retained its character; for from the earliest Greek physicians, to the present time, it has been highly esteemed. It is true, that in England it is not now so much used, yet on the Continent it is still described as "bon discussif, resolutif, chasse les vents, attenue dans l'asthme et les obstructions." We receive the gum chiefly from the East Indies but in very small quantities.

Genus FERULA. (Tourn.)

F. communis (Lin.), *F. nodiflora* (Smith in Flor. Græc.), *F. fœmina* (Tourn., Plumer, and Moris). Common giant fennel. This plant is a native of Southern Europe, and is especially interesting from its historical associations as well as its economic applications. The name *Ferula* is said to be derived from *ferio,* I beat; and according to Juvenal, Martius, and other classical writers, its hollow pithy stems were used to beat children, because they were more frightened by their size and the noise they made than by the punishment they inflicted. Pliny mentions the use of these light stems in his time as walking-sticks, especially adapted to the use of the aged, from their extreme lightness; and to this day it is similarly employed in the countries bordering on the Mediterranean. The pith with which the thick stems of the giant fennel are filled, is used in the South of Europe as tinder, and the stems are employed for keeping fire and carrying it from place to place. From this circumstance arose the fable of Promœtheus, who is said to have stolen fire from heaven, by concealing it in the stem of the *Ferula.* The ancient Romans used this plant as a culi-

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nary vegetable, the parts employed being the tender tops and umbels. These also were preserved for winter use, and in that state was called *Corymbi*. In Apulia this plant, which is most abundant, is of great value to the agriculturists, who feed their large droves of buffaloes with it, those animals preferring it to almost any other food.

F. assafœtida (Lin.), *Narthex assafœtida* (Falconer). *Assa-fœtida — Asafœtida* (Fr.), *Sturkender asand* (Ger.), *Duivelsdreck* (Dut.), *Assafetida* (Port.), *Hilteet* (Arab.), *Ungoozeh* (Pers.), *Pérungĭum* (Tam.), *Ingoovia* (Tel.), *Hinga and Hingoo* (Sans.), *Hing* (Hind.), *Angoo* (Malay), *Hinghoo* (Cyng.) A native of Saristan, Affghanistan, and the Punjaub. This remarkable plant has been for ages prized on account of the resinous fetid gum obtained by puncturing the upper part of its large fleshy parsnep-like root, but its history is involved in some obscurity, owing to its being confounded with the product of another plant. There is very strong reason to believe that it was known both to the Greek and Roman physicians, and that its gum-resin was extensively employed by them. The name appears to be a corruption of *lasser* fœtida, a name well known to the ancients. The earliest mention of its present name is by Nicolaus Myrepsus, one of the latest of the Greek physicians, 1227 A.D., who wrote of ασαφιτιδα

According to Ainslie, the Brahmins use the gum very extensively as a remedy against flatulency and indigestion. The Arabians impute aphrodisiac virtues to it. In Europe it has a high reputation, and deservedly so, in spasmodic and convulsive affections, especially in hysteria and asthma. In India, where it is cultivated, and also in Persia, where it is wild, the whole plant is used as a culinary vegetable, the foliage being boiled and eaten as greens, and the root is also used when roasted. The Arabian physicians use the fruit (seeds) as a stimulant medicine.

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Nearly all the gum we import comes from Bombay, to which place it is brought from Persia — chiefly from Herat, in Korassen, where it is a staple export. We receive it in three forms, packed in casks and cases. They are —

1st. Assafœtida in grains or tears, which is very rare; and it has been suggested, with great show of justice, that it is the production of a distinct species — *Ferula Persica;*

2nd. Lump assafœtida — its usual form; and

3rd. Stony assafœtida, which is also very rare.

The quantity of all sorts imported into this country annually, rarely exceeds eighty cwt.

F. (an uncertain species). It has been stated, though upon dubious authority, that the Gum Sagapenum of British pharmacy is the produce of a Ferula.

Genus DOREMA. (Don.)

D. ammoniacum (Don.), said to be *Heracleum gummiferum* by Willdenow. *Ooshăk* (Persian). The Ammoniacum plant. A native of Persia. The gum resin yielded by this plant exudes from punctures made by "innumerable beetles," which attack the green stems of the plant. It occurs both in the form of rounded drops (tears) and also in mass, the latter formed by the agglutination of tears, the forms of which are visible when the lumps are broken. It is called by the French *gomme ammoniaque*, by the Germans *ammoniak*, by the Persians *Semugh bilshereen*, in Arabic *Ushek*, and in Dukkanie *Ushek* and *Féshook*. It is exported from Bushire, on the Persian Gulf, to India, and from thence we receive it. The imports are small and irregular, a chest or two coming occasionally. Its chief use is in plaisters, although it is sometimes administered internally as an antispasmodic.

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Genus PUCEDANUM. (Koch.)

P. officinale (Lin.), *P. altissimum* (Desf.), *P. alsaticum* (Poir.), *P. majus Italicum* (Bauh.), *Selinum peucedanum* (Sowerby's Eng. Bot.). Officinal or sea sulphur-wort, horestrange, horestrong, sow-fennel, hog's-fennel, and brimstone-wort. This plant is a native of Europe, and occurs, rarely, in Britain in salt marshes. Amongst the herbalists its roots are in repute, and especially the juice of the root dried, as a diuretic and antispasmodic, but its use is dangerous.

P. oreoselinum (Cusson.), *Athamantha oreoselinum* (Lin.), *Selinum oreoselinum* (Scop.), *Oreoselinum nigrum* (Delarb.), *Oreoselinum legitimum* (Bieb.), *Cervaria oreoselinum* (Gaudin). Mountain parsley. Native of Middle Europe and the Caucasus. The leaves, stems, and fruits are used, chiefly on the Continent, as bitter aromatics and powerful stimulants of the intestinal canal. Don says, the whole plant is gratefully aromatic and deserves to be better known.

P. montana (Koch.), *Selinum montanum* (Schleich.), *Selinum palustre* (Lin.), *Selinum nigricans* (Gaud.), *Selinum Austriacum* (Hall, fil.), *Selinum polymorphum* (Spreng.). Probably this is only a variety of the *P. Austriacum*. (Koch.). Mountain milk parsley or sulphur-wort. Native of England, Switzerland, France, and Russia. It is only used in Russia, where its hot acrid root is occasionally substituted for ginger, and in Courland it has great reputation as a cure for epileptic fits.

P. sylvestre (De Cand.), *Selinum sylvestre* (Lin.), *Thysselinum palustre* (Hoff.), *Peucedanum palustre* (Mœnch and Koch.), *Athamantha flexuosa* (Juss.), *Athamanta pisana* (Savi.), *Selinum schiwereckii* and *S. intermedium* (Bess.), *Selinum cantabrigiense* (Fisch.). Wild sulphur-wort—milky parsley. Native of the marshes and meadows of Northern and Eastern Europe, in some parts of which it has a certain repute as an antidote to poisons.

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Genus IMPERATORIA. (Lin.)

I. ostruthium (Lin.), *Angelica officinalis* (Bauh.), *Selinum imperatoria* (Crantz.), *Peucedanum ostruthium* (Koch.), *Imperatoria major* (Bauh.), *Laserpitium Germanicum* (Fuchs.), *Astrantia imperatoria* (Don.), Sparrow master-wort, common master-wort, or great master-wort. The master-wort is a native of Europe and Newfoundland, and formerly was regarded as an important plant in the *Materia Medica* of this country; it is still cultivated in the neighbourhood of London for the herb vendors. Its medical properties are said to be diuretic, and eminently febrifuge. The root was considered a sovereign alexiterial or poison antidote; it was held to be a cure for quartan ague, and when chewed, for rheumatic toothache. Many other virtues were imputed to it, and the root was considered to possess such restorative powers, that it was chewed by military men to sustain them through the fatigues of forced marches. It is now only employed by the herb empirics.

Genus ANETHUM. (Tourn.)

A. graveolens (Lin.), *Pastinaca anethum* (Spreng.), *Anethum minus* (Gonan.), *Selinum anethum* (Roth.), *Fœniculum vulgare* (Hook. in Beech. Bot.). Common dill. *L'Anith* (Fr.), *Dill* (Ger.), *Aneto* (It.). This plant has a wide geographical range, probably arising from the esteem in which it has been held from the most remote antiquity. It is found in the South of Europe, Egypt, Astrachan, Timor, the Cape of Good Hope, and in India, and has probably become naturalized in some of these places. It is mentioned by Hippocrates and Dioscorides, and Pliny attributes to it various properties. The whole plant, according to him, has a "carminative effect, and

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allays looseness of the bowels. The roots applied topically infused in water or wine, cure defluxions of the eyes. The seeds smelt, when boiling, arrest hiccup, and taken in water relieve indigestion. The ashes of the plant relieve swelling of the uvula, but the plant itself weakens the eyesight and the generative powers." In modern practice, the seeds (fruit) and their essential oil and the distilled water are used as carminatives chiefly for infants.

In India the dill is highly prized and is sometimes sold in the bazaars as carraway seed. The seed only is used, and its infusion is considered a powerful stomachic, and is administered as a cordial drink to women immediately after parturition. The green leaves of the plant, made warm and moistened with oil, are applied externally to assist suppuration. This mode of applying the green leaves of plants, externally, is common in India.

In this country the plant is sometimes cultivated, and is used to flavour pickled gherkins and other pickles, and occasionally in soups. The Cossacks use it as a condiment to flavour their food. The seeds are employed also in flavouring some varieties of spirits and liqueurs.

Genus PASTINACA. (Tourn.)

P. sativa (Lin.), *Selinum pastinaca* (Crantz.), *Anethum pastinaca* (Wib.), *Pastinaca opaca* (Horn.), *P. sylvestris* (Huds.), *P. sylvestris, latifolia* (Raii. syn. 206), *Siser sylvestre* (Fuchs.).

It is the *Pastinaca sativa, var β edulis of* De Cand. The cultivated or common parsnip. *Panais* (Fr.), *Pastinake* (Ger.), *Pastinaka* (It.), *Pingsternakel* (Dut.), *Charibaria* (Span.) This culinary vegetable is a native of Europe, and has been cultivated for ages, although, from Pliny's description of it, it must have improved greatly since

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his time. Several varieties are now cultivated, some in gardens for table use, and others in the fields for feeding cattle, which are very fond both of the leaves and root; and cows are said not only to thrive on them but to have their milk much improved by this kind of food.

In the north of Ireland, a kind of beer is made by the peasantry of parsnip roots and hops, which is said to be both agreeable and wholesome; parsnip wine is also made in many parts of this country. According to Gerarde, a very good bread was made from these roots in his time.

P. sekakul (Russ.), *Heracleum pumilum* (Viv.), *Tordylium suaveolens* (Delile), *Pastinaca dissecta* (Van.), *Tordylium sekakul* (Mill.), *Zozima absinthifolia* (in Bartlet). The sekakul parsnip. A native of Syria and Egypt. It is cultivated as a culinary vegetable in the Levant under its specific name. It is also eaten under the same name in Turkey and Persia, where it is highly esteemed as a dietetic vegetable.

Genus HERACLEUM. (Lin.)

H. flavescens (Baumgarten), *H. flavescens var. α latifolium* (De Cand.), *H. sibiricum* (Lin.), *H. Austriacum* (Pall.), *Sphondylium conforme* (Mœnch). Yellowish cow-parsnip. It is from this plant, which is a native of the damp meadows in Northern Russia, that the Kamtschatdales distil their Raka or strong spirit.

H. spondylium (Lin.), *H. proteiformis* (Crantz.), *H. brancaursina* (Allioni), *Spondylium branca* (Scop.), *Spondylium branca-ursina* (Hoffm.), *Acanthus Germanica* (Fuchs.). The common or *Spondylium* cow-parsnip. This large umbelliferous plant is very common in Great Britain and through many parts of Europe, even to Siberia. It is applied to various purposes. In this country it is often collected for feeding cattle and pigs, which thrive and fatten on it;

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hence in Sussex the common name for it is *hog-weed.* In country pharmacy the seeds are also sometimes used as stomachic and diuretic medicine. The Russians gather the young shoots and leaf stalks, and after peeling them, dry them in the sun, and then store them in bags. In time these prepared stalks become coated with a liquorice-tasted saccharine exudation, and they are eaten as a delicacy. They also mix these prepared stalks with the fruit of the bilberry *(Vaccinum uliginosum)*, and distil from them an ardent spirit, which is said to be superior to that which they manufacture from grain. The Poles and Lithuanians brew a kind of beer from the stalks, similarly prepared; and some of our own peasants boil the young shoots, when they have grown a few inches above the ground, and enjoy a delicate and wholesome vegetable, not very inferior to the asparagus of their wealthier neighbours. The "lazy root" has, however, driven this and many other excellent vegetables from the poor man's table.

H. lanatum (Mich.), *H. spondylium* (Cham et Schlect). Woolley cow-parsnip. A native of Virginia, Pennsylvania, Canada, and other parts of North America. The young shoots are eaten by the Chenook and Cree Indians, and so also are the roots and stems, under the name of Penpoon antic, or flute-stem.

H. cordatum (Presl.), *H. spondylium and H. panaces* (Ucria). Cordate-leafletted cow-parsnip. A native of Sicily, where its black sweet-scented roots are called *angelica*, and are used as such.

H. pubescens (Bieb.), *Spondylium pubescens* (Hoffm.), *H. speciosum* (Ledeb.), *H. panaces* (Steven). Pubescent cow-parsnip. A native of Southern Tauria and the Eastern Caucasus, where its young shoots are gathered and eaten by the inhabitants, generally in the raw state; they contain a sweet aromatic juice, which the natives call Baldergan.

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There is now in cultivation in this country another species of cow-parsnip, called *H. gigantcum*, an enormous herbaceous plant, which has been strongly recommended as food for cattle. It was sent to the Liverpool Botanic Garden from Russia, but I have not yet met with its botanic history.

Tribe IX. SILERINEÆ.

Genus GALBANUM. (Don.)

G. officinale (D. Don.). *Officinal galbanum.* Native country not determined, although Dioscorides stated it to be Syria. It still continues one of the mysteries of pharmacy. It is first mentioned in Exodus xxx. 34 —"And the Lord said unto Moses, Take unto thee sweet spices, stacte, and onycha, and galbanum." It was used by Hippocrates and Dioscorides in medicine. Pliny tells us it was obtained on the mountain of Amanus, in Syria, and was, under the names of *Galbanum* and *Stagonites*, sold in his time for medicinal purposes at five denarii per pound. We import it in the form of tears and in mass, from the Levant and from India; and use it for various medicinal purposes, chiefly externally, and yet to the present time we are not sure we are right in attributing its production to this plant; and we are altogether uncertain as to the actual country which produces it.

Tribe X. CUMINEÆ.

Genus CUMINUM. (C. Bauhin.)

C. cyminum (Lin.), *Cumin* (Fr.), *Ramischer-Kumul* (Ger.), *Komyn* (Dut.), *Kummen* (Danish), *Cuminho* (Port.), *Kemun*

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(Arab), *Zereh* (Pers.), *Doeroe* (Cyng.), *Jeera* (Bengalee), *Zira* (Dukkanhie and Hindostanie), *Siragum* (Tamool), *Gilakara* (Telingoo), *Jīrākā* (Sans.), *Jeerágá* (Canarese), *Jintan* (Malay.) The officinal or common cumin. The cumin is a native of Upper Egypt and Ethiopia, but has found its way over a great part of Asia, and is extensively cultivated in Sicily and Malta. That it was cultivated by the ancient Hebrews, is proved by the allusions to it in the Old and New Testaments: for instance, in Isaiah xxviii. 27—"But the fitches are beaten out with a staff, and the cumin with a rod;" and again, in Matthew xxiii. 23—"For ye pay tithes of mint, anise, and cumin." In Pliny's time, cumin seed was reputed to have the effect of producing paleness. He says—"It is generally stated that the disciples of Portius Latro, so celebrated among the professors of eloquence, used to employ a drink made of it, for the purpose of imitating that paleness which had been contracted by their master through the intensity of his studies." He also assures us, that Julius Vindex, the son of a Roman senator, by the same means played upon the feelings of those who were looking for his death in the hope of benefiting by his will. It was also used by the ancient Greek physicians, who speak of two varieties of the plant. A great many medicinal properties were attributed to the seed.

Pliny gives it a place also amongst culinary vegetables as a condiment, for he says—"but it is cumin that is best suited of all the seasoning herbs to squeamish and delicate stomachs." It is still retained in our *Materia Medica*, but is seldom used; it is, however, frequently employed in veterinary medicine. It is largely employed in India and in Southern Europe as a carminative and stomachic; and in Malta and Sicily, where it is most extensively cultivated, it is called *Cumino aigro*, or hot-cumin, to distinguish it from anise, which is called *Cumino dolce*, or sweet cumin.

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The quantity imported into this country is very small, and does not exceed four tons annually, nearly all of which comes from Smyrna.

In the countries of Northern Europe and by the Jews generally, cumin seed is employed in flavouring food, and it is even eaten with bread and butter.

Tribe XI. THAPSICEÆ.

Genus THAPSIA. (Tourn.)

T. garganica (Lin.) Garganian deadly-carrot. The bruised root of this plant is occasionally used as an external application for resolving tumours.

T. silphium (Viv.). Silphium deadly-carrot. A native of Northern Africa, on the mountains of Cyrenaica. The chief interest attached to this plant arises from the fact, that it is supposed to be the *Silphium* of the ancients—a medicine so highly extolled that medals were struck in honour of it; and it is by the discovery and examination of these medals, that modern botanists have arrived at the conclusion, that the *Thapsius silphium* here mentioned is the plant alluded to. This supposition has been much strengthened by the fact, that no similar umbellifer at present grows in the locality indicated. This is, however, no proof, for even in Pliny's time it was so scarce there, owing to the numerous flocks of sheep kept, that a solitary stalk found was thought so precious and rare that it was presented to the Emperor Nero. The neighbourhood in which it grew was called *Regio silphifera*. The virtues attributed to this wondrous drug, which sometimes realized its weight in gold, and was never less in value by weight than silver, were that it assisted in expelling the dead fœtus, and was a cure for the irritations of the trachea. It was able to

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neutralize the most deadly poison, cure envenomed wounds, restore sight to the blind, and restore youth to the aged! These marvellous qualities were supposed to reside in the resinous juice, which was obtained by incisions of the stem; and it is no wonder, that with a belief in such powers, the sale of 15,000 pounds of this drug, found by Julius Cæsar in the public treasury, assisted in paying the expenses of the first civil war. It is still however a matter of some doubt, whether it be really the produce of this plant. Some have insisted upon its being *opoponax (Chironium opoponax*, formerly *Laserpitium opoponax);* the drug itself was generally called *Laser;* others attributed it to *Thapsia asclepium;* and many have believed it to be the true *Assafœtida.* It has also been ingeniously suggested, that *laser* is a corruption of *lacter*, signifying milky juice, and was applicable to such products, from many plants: for their were certainly different qualities of the *Silphium* or *Laser* — as *Laser* of Hercules, *Laser* of Æsculapius, *Laser* of Charon, *Laser* of Theophrastus, and above all others, the *Laser* of Cyrenaica, which formed so important a staple of that Hellenic colony, that its figure was impressed upon the current coins of the place. The chief exports were to Greece, Egypt, and Italy.

Another interesting illustration of the ancient esteem for this plant, is found in the mention of it, repeatedly under the name of *Silphion*, by Plautus, in his play of "Rudens." Pliny speaks of a tract of land in Cyrenaica or Pentapolis, wholly occupied with the cultivation of this plant, which was thirty miles in breadth by two hundred and fifty in length; it was situated about thirty miles from the sea shore.

Genus LASERPITIUM. (Tourn.)

L. glabrum (Crantz.), *L. latifolium* (Lam.), *L. Libanotes* (Lam.) Glabrous laserwort. Native of the Alps and other

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mountainous parts of Europe. Its warm aromatic and somewhat acrid roots are employed by the peasantry in some parts as aperient, sudorific, and stimulating medicine, and the veterinary doctors also employ it as a horse medicine.

L. siler (Lin.), *L. montanum* (Lam.), *L. trifoliatum* (Sieb.), *Siler lancifolium* (Mœnch), *S. montanum* (Mor.), *Ligusticum garganicum* (Till.). Withy, or mountain laserwort. A native of the mountains of Middle and Southern Europe, where it is sometimes used as a tonic and febrifuge, and in disorders of the stomach. It is also employed in the cure of hæmorrhoids and spitting of blood. It yields an aromatic resinous oil, or oleo-resin, which, mixed with syrup, is given internally for disorders of the breast.

Tribe XII. DAUCINEÆ.

Genus DAUCUS. (Tourn.)

D. carota (Lin.), *D. vulgaris* (Neck.), *D. polygamus* (Jacq.), *Caucalis carota* (Crantz.). The common carrot. *Carrotte* (Fr.), *Möhre* or *Gelbe rübe* (Ger.), *Geele wortel* (Dut.), *Carota* (It.), *Zana horia* (Span.), *Jezer* (Arab.), *Zerdek* (Pers.), *Carrot kalung* (Tam.), *Gazerragedda* (Tel.), *Gajur* (Duk.) The carrot now cultivated in most parts of the world is a native of Europe, Tauria, and the Caucasus. It was well known to the ancients, and was employed by the Greek physicians Dioscorides and Hippocrates, under the name of σταφυλινος; at least it is supposed that this is the plant meant; but it seems by no means certain that Pliny knew this species of carrot, and it is very clear from his writings, that it was not known in his time as a culinary vegetable. It was not cultivated in England until the time of Queen Elizabeth. Parkinson, writing in 1640, says—"the ladies wore carrot leaves instead of feathers," for which they certainly are a

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beautiful substitute. It is now very largely cultivated for its root, which is one of our most wholesome and nutritious vegetables. It is also of great value in horse-feeding; and is employed in medicine for making cataplasms, which are said to have especial efficacy in cleansing foul sores. In India abundant crops are raised in the Mahratta and Mysore districts, as food for the natives, who much esteem them.

Like most other culinary vegetables, the carrot has several varieties, the chief of which are the large red field carrot; and of the garden kinds — the early horn carrot, the late horn carrot, and the early red; the white, yellow, long yellow, long orange, long red, and Altringham: the last is much esteemed and very extensively cultivated; so also is the early horn.

Tribe XIII. ELÆOSELINEÆ.

Tribe XIV. CAUCALINEÆ.

No useful products are yielded by these tribes.

Tribe XV. SCANDICINEÆ.

Genus ANTHRISCUS. (Hoffm.)

A. cerefolium (Hoffm.), *Scandix cerefolium* (Lin.), *Cerefolium sativum* (Bess.), *Chærophyllum sativum* (Bauh.), *Chærophyllum cerefolium* (Crantz.), *Chærofolium sativum* (Trag.) Cultivated or common chervil. *Cerfeuil* (Fr.), *Gartenkerbe* (Ger.), *Cerfoglio* (It.). The garden chervil. A native of Britain and many parts of Southern Europe; is cultivated as a salad

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herb, especially in France, where it is regarded as an indispensable. It is also used in soups. Several physicians have attributed great power to it in the cure of dropsy, but this qualification is not much relied upon.

Genus CHÆROPHYLLUM. (Koch.)

C. bulbosum (Lin.), *Scandix bulbosa* (Roth.), *Myrrhis bulbosa* (Spreng.). Bulbous-rooted cicely. Native of Germany, Siberia, and even of Persia. Occasionally the roots have been used as food, for which purpose they are dug in the spring and boiled, after which they are eaten with oil and vinegar; but it does not seem quite certain that they are innocuous.

Genus MYRRHIS. (Hoffm.)

M. odorata (Scop.), *Scandix odorata* (Lin.), *Chærophyllum odoratum* (Lam.). Sweet cicely, or great chervil. A native of Great Britain and most parts of Europe. This herb was formerly in great favour as a salad plant in this country, and probably was a valuable adjunct to the coarsely grown vegetables with which our forefathers made their salads, before the more modern lettuce, endive, &c., were successfully cultivated; but at present it is not used in this country. In Germany, however, it is employed as an ingredient in soups. When polished oaken floors were common in this country, they were rubbed with the seeds of this plant, and thereby received an agreeable perfume. Bees are said to like it, and hives are rubbed with it in consequence.

It is said by some authors, the seeds were also employed to polish as well as perfume furniture and floors of marqueterie. This, however, is not probable, as, from the absence of *vittæ* in the fruits, they are not gifted with such a quantity of oil as would make them useful in this

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respect. The roots also have an agreeable aromatic flavour, and were candied in sugar and sometimes even boiled and made into tarts.

Tribe XVI. SMYRNEÆ

Genus ARCTOPUS. (Lin.)

A. echinatus. Spring bear's-foot, or rough arctopus. Is a native of the Cape of Good Hope, where it has a great reputation as an anti-siphylitic medicine.

Genus CACHRYS. (Tourn.)

C. odontalgica (Pall.). Tooth-ache cachrys. A native of Siberia, Tauria, and Caucasus. The Cossacks of Jaik, according to Pallas, chew the seeds for the cure of tooth-ache, which they effect by producing copious salivation.

C. libanotis (Lin.), *Hippomarathrum libanotis* (Koch.), *H. siculum* (Bocc.). Libanotis, or smooth-seeded goat's-fennel. A native of Sicily and Mauritania, where its root, which is heating and drying, is applied externally for the cure of hæmorrhoids.

Genus PRANGOS. (Lindl.)

P. pabularia (Lindl.). The fodder prangos. A native of the north of India. In the cooler parts of the mountainous districts, this plant is extensively cultivated as food for cattle, which thrive upon it more rapidly than any other fodder; besides which, it is the most productive fodder plant known, and has often been recommended for cultivation in this country. It is either given fresh or is made into hay; and has the remarkably valuable property of destroying the *liver fluke (Fasciola hepatica)* in sheep.

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Genus HERMAS. (Lin.)

H. gigantea (Lin. fil.), *Bupleurum giganteum* (Thunb.). The gigantic hermas. A native of the Cape of Good Hope, where the soft wool, with which its foliage is covered, is scraped off and used for tinder.

Genus CONIUM. (Lin.)

C. maculatum (Lin.), *Cicuta maculata* (Lam.), *Cicuta domestica* (Mor.), *Coriandrum maculatum* (Roth.), *Coriandrum cicuta* (Crantz.), *Conium tenuifolium*. Common hemlock, or spotted stemmed hemlock; sometimes also called *keghs*. The hemlock is a native of nearly all parts of Europe; it is also found naturalised in North and South America and the eastern parts of Asia. Notwithstanding the objections which have been raised, sufficiently satisfactory evidence exists to support the opinion that our *Conium* is identical with the κωνειον of the Greeks—the state poison of the Athenians, celebrated especially as the fatal draught of Socrates. Although in the synonymy of this plant it will be seen that some writers have given it the generic name of *Cicuta*, it is a serious error to confound it with that genus, and a more serious one to mistake it for *Cicuta maculata*. Pliny says, in his time, "the stalk was eaten by many people either green or cooked in a saucepan." This must have been a mistake, as the deadly poison of this plant, though most active in the seeds, is also very active in all parts of the plant. This poisonous principle is separable in the form of an oily looking transparent fluid, of the specific gravity of 0·89, or 0·11 lighter than water. This substance is called *Conia*, and is found constantly combined with an acid called *Coniic acid*. Instances have been known of delirium being produced by accidentally eaten hemlock roots. Kircher mentions two priests who became "raving mad," and mistaking them-

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selves for geese, plunged into the water; and Orfila relates a case of furious madness, produced by the same cause in a vinedresser and his wife.

Genus ARRACACHA. (Bancroft.)

A. esculenta (De C.), *A. xanthorhiza* (Bauer.), *Conium arracacha* (Hook's Exot. Flor. Bot.). Esculent arracacha. The arracacha of the South Americans, of Bogota, and of the Caraccas and Andean tribes; and the apio of some of the European settlers—so called from its resemblance to celery. This plant is a native of South America, about Santa Fè de Bogota, and the Caraccas, where, as well as in all parts suited to its cultivation, it is a highly valuable esculent vegetable. The part used is the root, which branches or separates into several parts, each as large as a full sized carrot. These roots are to the natives of the countries in which they are grown the same as the potato to the European, and are the everyday vegetable. They yield an abundance of starch, which is used as arrow-root, and they are also employed in distilling a spirit, as the potato is in the north of Europe. It will not grow except at some elevation on the mountain ranges, where it can find a temperate climate, and the soil must be rich and light. The plant has been fairly tried in this country, but without success; it, however, flowered in the Liverpool Botanic Garden, under the care of Mr. Shepherd.

Genus PHYSOSPERMUM. (Cusson.)

P. cornubiense (De Cand.), *Ligusticum cornubiense* (Lin.), *Physospermum commutatum* (Spreng.). The Cornish physospermum. No other locality is known for this plant than Devon and Cornwall; its only use is as food for cattle, which are exceedingly fond of its foliage.

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Genus SMYRNIUM. (Koch.)

S. olusatrum (Lin.). Formerly called in Italy *Herba-Alexandrina. Maceron* (Fr.), *Macerone* (It.), *Smyrner kraut* (Ger.). Common Alexanders, or Alisander. A native of Britain and most parts of Europe. In this country and in other parts of Europe it was formerly much grown as a pot and salad herb, but is now seldom used. It, however, retains a place in the vegetable gardens of the French.

Tribe XVII. CORIANDREÆ.

Genus CORIANDRUM. (Hoffm.)

C. sativum (Lin.), *Coriandre* (Fr.), *Koriandre* (Ger. and Dut.), *Coriandro* (It.), *Coentro* (Port.), (Sp.), *Cóttamillie* (Tam. and Tell.), *Mety* (Malay), *Cotumbaroo* (Cingalese), *Dunya* (Hindoo), *Dhunnian* (Dukanie), *Dhănyàkă* (Sans.), *Kezereh* (Arab), *Kishneez* (Pers.), *Kurbara shamie* (Egypt.). The common or cultivated coriander. The coriander is a native of Southern Europe, but is cultivated in this country, in Egypt, India, and other parts. Wherever it is known it is used as a gentle carminative and aromatic. In Europe it is most used in confectionery and in flavouring spirits and liqueurs. It is also employed in "*doctoring*" some kinds of ale. Its ancient history leads us very far back. In Exodus xvi. 31, we read—"And the house of Israel called the name thereof manna: and it was like coriander seed, white." The Greeks used it under the names κοριον and κοριανον, and the eminent Greek physicians Dioscorides and Hippocrates employed the seed medicinally. Pliny mentions it, but the author thinks there are grave reasons for doubting that it is the same plant as our coriander. Doubtless the true coriander was

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known to the Roman naturalist, but some mistake may have arisen in the translation of his name for it, because he states that it is not found wild in Italy, and that it is brought from Egypt. Now, at least we know that it is wild in Italy, and that Egypt receives its supply from India, where it is only known as a cultivated plant; besides which, Europe is more particularly the geographical location of the Umbelliferæ. Again, Pliny attributes such potent properties to his coriander, that we can hardly suppose him to have been so ignorant of its real characters.

SUPPOSED TO BELONG TO THIS ORDER.

Sumbul root. Two varieties of a large root have been lately introduced into European pharmacy, which from certain characteristics are supposed to belong to the Umbelliferæ. Both varieties—the Russian, which is the more valuable, and the East Indian—are in pieces, being transverse sections of a rather woody root about the size of a parsnip, and of a drab or whitish colour, having a rather strong smell of musk. The Indian variety is sometimes brought from China. It is used as an antispasmodic in substance or in tincture.

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FOURTH ORDINARY MEETING.

ROYAL INSTITUTION, 29th November, 1858.

The REV. H. H. HIGGINS, M.A., Sen. V.P., in the Chair.

Mr. NISBET submitted the bodies of two chameleons, one of which had been kept alive, at Egremont, for a period of eighteen months. The other had laid numerous eggs, which, with the animal, were deposited in the museum of the Institution.

Mr. ARCHER exhibited a very convenient lecture-room microscope, which could be passed from hand to hand; also some cocoons of the Australian silkworm.

Mr. H. DUCKWORTH described the recorded appearances of Donati's comet in India.

The paper for the evening was then read, "ON BONES AND BONE MANURE," by NEWTON SAMUELSON, Esq., F.C.S.

The author entered minutely into the chemistry and analysis of bone, its preparation and application to the soil. He traced the history of its use in agriculture, described the soils best suited for it as a manure, and the process by which it could be most profitably employed. The manufacture of organic superphosphates, led to the consideration of mineral superphosphates, and the exhibition of specimens, from deposits of extraordinary richness, the tests ranging from 55 to 91 per cent.

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FIFTH ORDINARY MEETING.

ROYAL INSTITUTION, 13th December, 1858.

The Rev. H. H. HIGGINS, M.A. Sen. V.P., in the Chair.

Dr. JOHN W. WATKINS was elected an Ordinary Member.

The resignation of Señor Don Manuel Pacheco was received and accepted.

The following communication was made by RICHARD BROOKE, Esq., F.S.A. —

OBSERVATIONS UPON THE MIGRATION OF THE SWALLOW TRIBE.

IT is a remark, which I believe has often been made by others, that the study of Natural History may make a man better, but never can make him worse, because this most interesting and instructive science peculiarly brings under our observation, never ending instances of the power, wisdom, and goodness of the Most High. In the Book of Nature we find recorded in indelible characters, abundant evidence of his care and benevolence; and amidst the myriads of animated creatures which this globe contains, every one of them is wonderfully formed and adapted to the position, habits and circumstances, in which it is destined to live. From the gigantic elephant down to the microscopic beauties of a little insect's wing, we discover proofs without end, of the care, contrivance and superintendence, of an all-wise and benevolent Creator.

Entertaining as I do, these opinions, I have always taken some degree of interest in Natural History, although I have never made it a study, and consequently I do not profess to be an adept in the science. I have, however, made some observations connected with the

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migration of Swallows, which I will now proceed to communicate.

At one period I paid some attention to the Swallow tribe, and noticed that the first to take its departure from this country was the Swift *(Hirundo apus)*, which almost always disappears about the 12th or 13th of August, but I once saw one at the end of August or early in September,* at Wilmslow, in Cheshire. The next in order of departure is the Sand Swallow *(Hirundo riparia)*; the next is the common Chimney Swallow *(Hirundo rustica)*, which usually disappears about the end of September, but I once (in 1832) saw a pair of them as late as the 20th of October; and the last is the Martin *(Hirundo urbica)* which frequently remains until the second week in October, and occasionally rather later.

I have known instances of the autumnal departure of the Swallows being retarded in stormy weather; a fact which was observable, in some degree, during the prevalence of gales of wind at the end of September and commencement of October, in the present year [1858]; and on at least two occasions I have known them disappear for several days, and then suddenly reappear, and their reappearance has been attended or followed by storms or heavy gales of wind; and it appears to me to be impossible to account for their sudden reappearance, except upon the principle that they must have encountered tempests, or that Swallows have the faculty of discovering when there is about to be a change for the worse in the weather, and therefore, occasionally, may be induced (to use a nautical expression) to "put back." In 1832 the circumstance was very observable, and a correspondence (from which extracts are subjoined) respecting

* In Mr. Gilbert White's Miscellaneous Observations, published in Mr. Jesse's "Gleanings in Natural History," 2nd series, p. 171, he mentions as a very extraordinary circumstance, that a Swift was seen on the 3rd September, at Lyndon, in Rutlandshire.

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these interesting and very useful birds, ensued between Mr. Jesse, the author of the "Gleanings in Natural History," and myself; and in consequence, Mr. Jesse has noticed the circumstance in the third series of his work, under the head, "Migration of the Swallow," page 193.

Extract from a Letter of 17th September, 1833, from Mr. BROOKE *to* Mr. JESSE.

"The middle and end of the month of September, 1832, were remarkable for the mildness of the weather, bright sunshine, and abundance of the insect tribe, in this town [Liverpool], and its vicinity. On the 25th of September, which was a warm and fine day, the common Chimney Swallow *(Hirundo rustica)* was skimming about as alertly (if not in as great numbers), as in the middle of summer; but on the 26th these birds were no longer to be seen, and it should seem as if they had suddenly taken their departure. The common Martin *(Hirundo urbica)* still remained here in considerable numbers, and on the 4th of October I saw many of them, but only one solitary Chimney Swallow. On Sunday, the 7th of October, the rapid fall of the mercury in the barometer announced the approach of a storm, or at least some great change in the weather, although throughout the day the weather continued mild and placid; and in the afternoon, whilst I was walking in the outskirts of this town, I was much surprised to observe about Everton, and more especially about Birchfield and Soho Square, great numbers of Chimney Swallows skimming and flying about; they appeared to be in good health and plumage, and were so bold as to pass within a few feet of me. I imagine that they had (to use a nautical phrase) "put back;" for on the next day, Monday, the 8th of October, the mercury in the barometer dropped more and more, and that to a degree seldom remembered here, and in the course of

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the morning a most fearful and violent tempest of wind and rain arose, causing dreadful disasters on the coast near this port, and attended with considerable loss of life. It is worthy of the attention of a naturalist to consider, whether these poor birds perceived indications of the coming storm over the surface of the ocean, and returned to the coast of Lancashire to avoid it.

"There was not a single Martin visible amongst them, nor did I observe any after the 4th of October, in or near this town.

"If it be a fact, as I consider it was, that the Chimney Swallows returned hither to avoid the coming tempest, they seem to have been reluctant again to take their departure; for on the 15th of October I saw several of them, and on the 20th of October* I saw a pair of these birds at Birkenhead, about a mile from Liverpool; they were occasionally flying, and sometimes perched on the cornice of a house, enjoying the sunshine, apparently healthy and alert.

"An instance somewhat similar to this occurred here, five or six years previously, when about the end of September or commencement of October, after the Swallows had disappeared for some days, they suddenly reappeared, and I saw them perched in multitudes, upon the friezes, cornices, and Corinthian capitals of the Exchange Buildings here; their reappearance being attended with violent gales of wind, which caused several ships to return to port.

"On conversing recently on this subject with Mr. George Keyzar, of this town, a retired master of a vessel, who for many years commanded a ship, trading between Liverpool and the West Indies, he informed me, that it had occasionally happened, that when his vessel

* Mr. Jesse, in his "Gleanings in Natural History," second series, page 109, states, that on the 25th of October, in that year (1832), he saw a pair of them hawking for flies over the river Thames, near Old Windsor.

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was in the Atlantic Ocean, and was very many miles from the continent of Africa, and particularly after strong breezes from the eastward, considerable numbers, both of Swallows and Martins, apparently blown off land, had alighted on the rigging and other parts of the vessel, and that, in general, they soon died, and as he conjectured, for want of food."

Extract from a Letter of 7th October, 1833, *from* Mr. JESSE *to* Mr. BROOKE.

"Allow me to say, that yours is one of those letters which I value, not only for the facts which it contains, but as one of the pleasing results of the work on Natural History which I ventured to publish.

"Your remarks tend to confirm my own observations, that the Swallow has an extraordinary faculty of discovering the approach of bad weather, whether stormy or frosty; and I have no doubt but that your suggestion is a correct one, that the Swallows had returned in order to avoid a tempest, which they must otherwise have encountered during their migration. During the last fortnight we have had some severe white frosts, with much fog; a day or two before they set in, the annual assemblage of Swallows on the aites of the river Thames took place, and they all disappeared the day before the frost began, nor have I seen any since. In the year 1831 they quitted us at a still earlier period, previous to a change of weather.

"I regret very much that I did not receive your letter at a still earlier period, as I am publishing another work on Natural History, and a paper I had written on the Swallow has just been printed. I will endeavour, however, to make use of your interesting communication before the work is finally completed."

The paper of the evening was then read—

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A COMPARISON BETWEEN ANCIENT AND MODERN VIEWS OF THE MIGRATIONS AND HABITS OF BIRDS.

By CUTHBERT COLLINGWOOD, M.A., M.B., F.L.S., &c.

The object of the following paper is two-fold, namely, first, to collect the opinions of various ancient writers upon certain ornithological theories, and secondly, to examine how far we have improved upon these up to the present time. In doing this, two things have particularly forced themselves upon my attention. The first of these is the near approach to truth, and the great amount of good sense exhibited by the naturalists of antiquity — the extravagances coming, not from their pen, but rather from those who incorporated their ideas with religious systems. The second remark to which I would direct special attention, is, how modern theorists have, in endeavouring to establish novel ideas, gone back to those of the ancients, and reproduced hypotheses long since exploded, by the natural advance of knowledge; and besides this, it will appear how much we, in the nineteenth century, have in common with the people of 2000 years ago, not only in science, but in the ordinary affairs of every-day life. Customs which we regard as characteristic of our own generation, and even particular modes of thought, which we might imagine to be as ephemeral as ourselves, are indeed not unfrequently traceable to a high antiquity, showing the common bond which unites the human race in all ages — the common source of our human nature — whether Greek, or Roman, or English — whether it be in the Iron, the Augustan, or the Victorian Era.

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The migration of birds was a phenomenon which could not fail to be remarked from the very earliest times, and has ever excited a degree of attention commensurate with its singularity. In that infant period of society, when men had no almanacks to guide them to the changing of the seasons, and no calendars to direct them in the planting out of their fields and gardens, it is not surprising that the arrival and departure of birds should have called forth their wonder and admiration, and at once have suggested itself as an index to direct them in their agricultural operations. We are most of us familiar with the regularity which marks the recurrence of these migrations, especially in the case of certain common birds; and it is not necessary in these times that a man should be an ornithologist, in order that he may notice when the swallows arrive, or when the well-known voice of the cuckoo is first heard. How much more, then, must the ancients have attended to these signs, which were to them most important guides in those operations on which their whole existence depended. Hesiod indeed, the most ancient Greek writer and one of the earliest Greek astronomers, informs us, in his "Works and Days," that husbandry was in great part regulated by the blooming of plants and by the coming and going of birds; and although this poet lived in the very mists of antiquity (nearly 900 years B.C.), it is not unlikely that this had been the case long before his time. As men, however, became acquainted with the means of more accurate astronomical observation, this primitive natural calendar passed out of repute, and gave place to something more exact and of more general application. Aristophanes, who flourished B.C. 400, speaks of it as a thing of the past in his renowned comedy of "the Birds," where it is said (l. 499), that "in former times the Kite ruled the Grecians;" for his commentator tells us, that by this the

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poet meant, that formerly the Kite was looked upon as the sign of Spring. Then again, he informs us (l. 505), that the Cuckoo, in like manner, governed all Phœnicia and Egypt, because when it cried "kokku," they considered it was time to reap their wheat and barley-fields.

This remarkable comedy of Aristophanes gives us (l. 693) a scheme of cosmogony, in which the birds play a very prominent part. The Chorus (which consisted of Birds) tells us that in the beginning were Chaos, and Night, and Erebus, and Tartarus, and that there was neither water, nor air, nor sky. What there could have been in those early days it is difficult to conceive, before these important materials existed; and the picture thus afforded is superbly blank and chaotic. The next step in the Aristophanic cosmogony is at least remarkable —"Blackwinged Night" proceeds the Chorus, produced a self-formed egg, whence, after a time, sprang Eros the much-desired, or plastic Love; and then follows the parentage of the Birds — for Eros, in conjunction with Chaos, produced the bird-kind, and before these, was there no race of immortals. The benefits they conferred upon mankind were commensurate with this high and ancient lineage:—"the greatest blessings," say they (l. 708), "which can happen to mortals, are derived from us; first, we show you the seasons, viz. — spring, winter, autumn; the Crane points out the time for sowing, when she flies croaking into Libya; she bids the sailor put away his rudder, and take repose, and every prudent man provide himself with an upper garment. Next, the Kite appearing, proclaims another season, viz., — that it is time to shear your sheep. After that, the Swallow informs you when you may sell your cloak, and buy light summer clothes."

Although these phenomena had ceased in the time of Aristophanes, to carry with them all the significance

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claimed by the speaker, it is remarkable, that even to this day, men whose pursuits are of an agricultural nature, are more or less guided by these mysterious reappearances of the feathered tribes. Thus the shepherds of Salisbury Plain say —

> When dotterel do first appear,
> It shows that frost is very near;
> But when that dotterel do go,
> Then you may look for heavy snow.

It is needless to multiply such proverbial sayings, which are indeed pretty numerous, nor are they confined to this country. Dr. Solander tells us, that the peasants of Upland have this saying, "When you see the white Wagtail, you may turn your sheep into the fields; and when you see the Wheatear, you may sow your grain," for in Upland, says the same authority, there is seldom any severe frost after the Wheatear appears, and sheep are housed all the winter in that inclement climate.

Although we can infer from no writer after Hesiod, that birds were looked upon as capable of directing the husbandman in his agricultural operations, still we are not to suppose, that after that time, they lost their influence and dignity. On the contrary, they appear to have gained a most extraordinary ascendancy over the minds of men, which increased to such a wonderful pitch, that at length, no affair of moment, either public or private, was entered upon without first consulting them. And the reasons of this growing reliance upon them, arose chiefly out of their curious migrations.

When thinking men meditated upon these remarkable movements, how they all disappeared at a certain time, as if by common consent, and then reappeared after a regular interval, they mistook cause for effect, and not unnaturally, regarded the birds as regulating the seasons, instead of the seasons as directing them. And since no

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man could say, with certainty, whither they went, or what became of them during the interval of their absence, it was no great wonder that they should imagine them to have retired somewhere beyond the sphere of the earth, and perhaps (who could tell?) might approach the region of Olympus, where they could hold converse with the very gods, and be enabled, by them, to predict future events. And when, in later times, it became known to travelled philosophers, that some of them might be seen high up the Nile during winter, that fact, instead of shaking the confidence of those who credited their prophetic gifts, only served to confirm their faith. For, if so, why should they not make periodical visits to Æthiopia, and even to Ammon, where they might meet Jove himself, and receive from him an annual ratification of their powers, and new messages from the counsels of the gods. The very foresight of the birds, as shown by the regularity of their times of departure and reappearance, seemed to have something of a divine nature in it, although Virgil, as in duty bound, being an Epicurean, disputes this matter, and declares that he believes it to be mere instinct. Still others believed it was not so; and thus it was almost natural for a superstitious people to believe that birds were the interpreters of the gods, *Aves internunciæ Jovis* (Cic de Nat. Deor: lib. ii. c. 34), as soon as any one boldly stood up and announced it as a fact. Hence arose Augury, one of the most ancient species of divination. "We are to you," exclaims the Chorus of Birds in Aristophanes, "Ammon, Delphi, Dodona, and Phœbus Apollo, for after consulting us, you undertake every thing — commerce, purchases, and matrimony." (l. 716).

Augury, by which was meant a forewarning notice concerning future events, derived from prophetic birds, was invented, according to various authors, by Prome-

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theus or by Tiresias: Pliny says (vii. 55) by Car — and Pausanias (in Phocicis), attributes it to Parnassus, son of Neptune. However that may be, it was Calchas (Homer Il. A. 69) who did most to raise the art to perfection, although he was finally beaten in a trial of skill with Mopsus. In such honour were the augurs held, that at Lacedæmon the king had always one by his side to consult with, who, when he sat in his divining seat to observe the birds, was clothed in white, and wore a crown of gold upon his head; and thus placed with his face towards the north, and having the east upon his right hand, the signs which occurred on that side were esteemed fortunate, and those upon the opposite or western side, unlucky. But the Roman custom was different; clothed in purple or scarlet, the Roman augur regarded the south, and his right hand pointed west, and thus has arisen that confusion in the two languages by which δεξιόν in Greek, and *sinistrum* in Latin, equally mean *fortunate*, though the first signifies the *right*, and the second the *left* hand; nevertheless, the Latin poets often adopted the Greek form, and the right hand was usually accounted lucky; hence wine was always passed from left to right, as were also lots. Birds then were lucky or unlucky, according to the circumstances under which they appeared, but a flock of all sorts of birds (Diodorus); an Eagle (frequently in Homer); a Dove or a Swan (also in Homer); — a Kingfisher and a Circus or Harrier (according to Pliny) were, under most circumstances, a happy presage. Equally *un*lucky were the following — Vultures, Hawks, Kites, and Buzzards, and indeed most birds of prey (according to Aristotle and Pliny); Owls (according to Ælian, though Plutarch accounted them lucky); Bats, "the onely bird that suckleth her little ones" (Pliny x. 61), and Swallows. This last may appear surprising, and they must in later

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times have been accounted more fortunate, but in Darius's Scythian expedition, they are said to have presaged the destruction of his army, and Tzetzes, the commentator on Hesiod, as well as Apuleius (Golden Ass), enumerate the Swallow in their list of inauspicious birds.

But there was another reason why birds were regarded as possessed of a supernatural knowledge of human affairs. As they were continually flying about, they were supposed to "observe and pry into mens' most secret actions, and to be acquainted with all accidents." Thus Peisthetærus in the Birds (l. 601) says, "No one knows of my treasure, except indeed *some bird*;" and Sophocles, in the Œdipus Tyrannus (l. 310), makes Œdipus say to Tiresias the augur, "If you have received any information concerning the death of Laius from the prophetic birds, divulge it." There was also a Greek proverb, to the effect that when they were engaged in any secret action, no one knew what passed, πλὴν γε ἴσως ὄρνις (except perhaps some bird). It will at once be recollected that we have to this day an analogous expression, inasmuch as we say, "A little bird told me," when we wish to affect mystery as to the true source of our information. (Compare Andersen's Märchen, "Der Tannenbaum").

Particular birds have, in all ages of the world, been the subjects of special worship, on account of some property or quality which has rendered them fit symbols of divine attributes. Thus the Ibis was worshipped in Egypt, as we learn from many writers, and the reason given by a great number is, that of Herodotus (ii. 75), viz. — that it fed upon winged serpents, which came out of Arabia in the spring. A score of ancient writers, nay two score, might be cited in support of this opinion. Another reason, however, says Maurice, in the Appendix to the "Ruins of Babylon," was founded upon the Egyptian love of geometry, because (according to Plutarch), the space between the

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legs of the Ibis when parted asunder as it walks, together with its beak, forms a complete equilateral triangle. The white Ibis, or Abou Hannes of Bruce, was pronounced by Cuvier to have been a weak-billed bird, quite unfit for destroying any serpents; moreover, such winged species as are referred to never had a real existence. Herodotus mentions two kinds of Ibis, the white, and the *black* one which was the species said to feed upon the serpents, but it is remarkable that this black species is never found in an embalmed condition. Some have therefore imagined, that ἶβις originally meant "a crane," which is a truly reptile-eating bird. In modern times, a somewhat analogous respect is paid to birds in many parts of the world. Thus the Storks are respected in Holland and Germany, and accommodation is provided for them on house-tops, of which if they avail themselves they are supposed to bring luck. Marabout Cranes are protected in India; and in Egypt large bronze vases of food are placed upon the roofs of certain ancient mosques for the use of the birds; the Pondicherry Vulture is venerated in the East, as the type of Vishnoo; a Cuckoo, the *Cuculus honoratus* of Linnæus, is so called from the honours it receives; and various birds are still employed in China to distinguish the different grades of Mandarins, who by law are obliged to have their particular bird embroidered upon their breast.

But the superstitious and uneducated of all ages have been more or less under the dominion of the birds, and the present age is no exception. Bishop Hall, describing the superstitious man says, "If a bittourn fly over his head by night, he makes his will;" and the importance attached by some to the ominous screech of the owl, is well known. The sight of a crow through a window in the morning is sufficient to deter some from going abroad, even to prosecute important business; and the words of presage —

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"One, sorrow,
Two, mirth,
Three, a wedding,
Four, death,"

are applied to the poor inoffensive Magpie. It is said that Cicero, flying from the emissaries of Antony, was warned by the noise of Ravens, that his end was near, and in the "Popular Antiquities" may be found the following:—"I have likewise a late example of a young gentleman, Mr. Draper, my intimate friend, who about five or six years ago, in the flower of his age, had on a sudden one or two ravens in his chamber, which had been quarrelling on the top of his chimney; these he apprehended as messengers of his death, and so they were, for he died shortly after." Pliny in his account of the Raven (x. 12) says, that their ominousness arose from their harsh note, which sounded not unlike a person in a choaking condition. The same author tells us (x. 32), that the Kingfisher was a bird of good omen, and at breeding-time foretold tranquil and calm weather; and still the fisherman and sailor look upon the Halcyon with a benevolent eye, and regard him as the harbinger of days, whose beauty has become proverbial.

Although the principles of migration are better understood by us than they were by the ancients, we are but little better acquainted with their winter retreats. We have seen how the ancients imagined them to quit our sphere, and to show how fond men are of going back to old and exploded theories, and how much pains a really well-informed person may take to uphold a favourite absurdity, I shall notice a theory, a full account of which may be found in that curious repertory, the Harleian Miscellany (vol. ii. p. 583). The writer of this paper, which bears no name nor date, but must have been penned about the middle of the last century, appears to have

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been Charles Morton, M.D., Secretary to the Royal Society. It is stated to be the production of an "eminent professor, for the use of his scholars, and now published at the earnest desire of some of them;" so that his theory, wild as it was, found supporters. It is entitled "An Inquiry into the Physical and Literal Sense of that Scripture, Jeremiah viii. 7, 'Yea, the stork in the heaven knoweth her appointed time; and the turtle and the crane and the swallow observe the time of their coming.'" Examining the passage critically, the author calls attention to the expression, the stork *in the heaven*, and remarks that the time of their coming might more properly be rendered *tempus itineris*, the time of their journey. Then reminding the reader, that birds had never been seen upon that journey, he deduces this marvellous result; "Therefore the Stork (and the like may be said of other season-observing birds, till some place more fit can be assigned to them) does go unto, and remain in some one of the celestial bodies; and that must be the moon, which is most likely because nearest, and bearing most relation to this our earth, as appears in the Copernican scheme; yet is the distance great enough to denominate the passage thither an itineration or journey." Truly, one would imagine so; the last inference may be safely granted. It must not be supposed, however, that objections did not present themselves to the mind of the astute professor, but he meets them manfully, and answers them boldly, if not scientifically. And first, the distance. The distance is undoubtedly formidable; it is calculated however, that the extreme velocity of a bird's flight would accomplish it in two months—they would spend three months in the lunar world, two months on the return journey, and the remaining five they could pass with us. Objector remarks that they would surely starve! Why, no—for it must be observed, that "at their departure they are very succulent

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and sanguine, and so may have their provision laid up for the voyage, in their very bodies;" besides, he adds, they would probably be *asleep* all the way, "which spares provisions." But they could never fly for two months at a stretch! Well, it does appear an extraordinary flight, but let us meet that objection by supposing that there are, between this and the moon, many "globules or ætherial islands" of which we can take no cognizance. But the moon revolves round the earth every twenty-eight days, the poor birds would never catch it! Dolt! *do* you not perceive that if they set out at full moon, and are two months on the journey, they will arrive also at full moon, when the satelliteis just in the same position with regard to the earth as when they started? And so the eminent professor has it all his own way, and his pupils "earnestly desire" that his extravagance may be immortalized.

A theory, little less physically impossible, has found acceptance with dispassionate and scientific observers, and that is, that in winter, some birds, at all events Swallows, retire to the bottoms of lakes and rivers, and pass the dead months in a torpid state under water. Olaus Magnus was one of the earliest, if not the first to adopt this strange theory. He was followed by Etmuller, and afterwards by Derham, who quotes a communication to the Royal Society, in 1713, from a Doctor Colas, "a person very curious in these matters, who saith, that he saw sixteen swallows drawn out of the Lake of Samrodt, and about thirty out of the king's great pond at Roseneilen; and that at Schlebittin, near a house of the Earl of Dohna, he saw two swallows just come out of the water, that could scarce stand, being very wet and weak, and that he hath observed the Swallows to be often weak for some days after their appearance." The Swedish naturalist, Alexander Berger,

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in the Calendar of Flora, published in the *Amœnitates Academicæ*, speaks of the Swallow retiring under water as a matter of course, and as much to be looked for as any every-day event. On September 17th, he enters "*Hirundo submergitur*," and that wise and good old naturalist, Gilbert White, although he does not say it in so many words, seems half inclined to put in his adherence to "the northern opinion (strange as it is), of their retiring under water." (Letter XII). It has been suggested, that the Upsal naturalist spoke of *leeches (Hirudo)*, and not of *swallows (Hirundo)*, in the entry in question, but this perhaps is scarcely probable. Even the illustrious Cuvier appears to have added the weight of his authority to the notion of submergence — speaking of the Martin he says, "That it bcomes torpid during the winter, and even passes that season under water in the bottom of marshes, appears to be certain."

It had been my purpose summarily to dismiss this part of the subject as not requiring any effort on my part to disprove it, but a correspondent has lately called my attention to the fact, that even in the present year, there are some who believe that it is not only possible, but that they themselves have been eye-witnesses of this long-current phenomenon. A lady, known to my correspondent, and living at Stockton-on-Tees, wrote to the *Darlington and Stockton Times*, declaring, that without any preconceived opinions concerning the submergence theory, she was herself a witness of the fact; and goes on to relate, that she and a person with her, saw a number of Swallows dip under the water, at Middleton, a village on the banks of the Tees, *never rising from under it again*. She watched them most closely for a great length of time, and was certain of the fact. Now here we have a positive observation, made by an educated lady, who however confesses, that she is no adept in natural history

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— and nothing can convince her that she was in any way deceived, inasmuch as she not unnaturally prefers the testimony of her own senses to the dictum of closet naturalists.

Now in examining into this statement, the first thing which strikes us is the positiveness of the observation. It is not easy to prove a negative. We may say that the thing is impossible — that no air-breathing animal *could* exist beneath an element so unfitted for its respiration as water — we may strengthen this argument, by calling to mind the active respiration of the class of Birds, and their very exalted animal heat — we may dwell upon the necessary suddenness of the change from air to water — we may argue, that no animals known to hybernate, are believed to submerge themselves — and we may clench the matter, by appealing to John Hunter's assertion, that independent of any observation, the submergence of birds in a living state was not possible; still, if any properly authenticated case, which when examined, proves to be out of the reach of fallacy, should occur, then must theory fall before it like ice before the sun. Let us therefore briefly examine the circumstantial account given by a credible witness, and corroborated by another. Is it possible that it can be without foundation? Imperfect observation, arising from a want of special information upon the subject observed, has perpetuated many an error, and retarded many a truth. Let us only recall the circumstantial account given us by good old Gerarde, who gravely tells us "What our eyes have seen, and what our hands have touched, we shall declare;" and then proceeds, in all good faith, to describe how Bernicle Geese grew upon trees, and fell thence into the water. Bearing in mind then, that the fair disputant disclaims any special knowledge of Natural History, let us hear her further. She

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goes on to say, triumphantly, "I can give you the exact day indeed — it was the *6th September*." Now here she has proved *too much* in her anxiety to support the credit of her statement. In the Swedish calendar of Alexander Berger, kept at Upsal, in lat. 60°, it is not pretended that the Swallow goes under water until September 17th. Why should *our* Swallows take to their water-bed eleven days sooner than their brethren do, six and a-half degrees further north? Indeed, it is well known to ornithologists, that the Swallow does not leave us until the beginning of October. Jenyns, from twelve years' observation, deduces a mean of October 14th — the *earliest* date being September 28th.

Let me then offer an explanation of this and other stories of the kind which are prevalent among certain classes in this country, and which are widely spread and deeply-rooted among the common people of Sweden; notwithstanding, that the University of Upsal has long offered large rewards to the discoverers of submerged birds, in vain. That Swallows dip in the water in their rapid flight is certain, and it is said, on the authority of Mr. Couch, though I cannot personally vouch for its truth, that they are capable of resting, for a few seconds, with outstretched wings, upon the still surface of the water, and then flying off again. Let us suppose now that it is late on an autumnal afternoon — the shades of evening are gathering round, and the active birds are skimming the surface of a quiet pool, crossing and recrossing, interweaving and intertwining in the mazes of their rapid flight. Under the most favourable circumstances, it is difficult to trace the course of any particular bird; but if dusk imperceptibly steals over such a scene, how easy would it be for an observer to imagine, that the birds, when they dipped or rested upon the water, really submerged themselves; — it would be next to impossible

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to recognise these birds upon resuming their flight; — while, as they retired by degrees to their roosting places for the night, the gradual diminution of their numbers would most readily confirm the impression, that those birds which were really only momentarily lost to view, had sunk beneath the protective bosom of the still, deceitful pool.

The simple hiding and hybernation of birds being a doctrine less extravagant, and more in analogy with recognised phenomena, has obtained wider credence. It is as old at least as the days of Aristotle, who tells us, that "many birds, and not a few as some imagine, hide themselves in holes," and he enumerates the Swallow, Kite, Thrush, Starling, Owl, Crane, Turtle, Blackbird, and Lark, as undoubtedly hiding themselves thus. Pliny also infers (x. 10) that Kites lie concealed in holes for some months. This doctrine of the hybernation of birds has received strong support from more modern naturalists. Schæffer, Hevelius, Derham, Ellis, Daines Barrington, Pennant, Gilbert White, and the Swedish naturalists, Klein and Kalm, were all more or less in favour of their hiding rather than migrating; and the great Linnæus himself lent them his countenance. It became, in the last century, a common mode of expression among those who were accustomed to derive their ideas from contemporary authorities; thus Sturm in his Reflections for April 28, says, "The mild air of spring awakens the Swallow from his benumbed state." But although numerous stories are recorded of torpid birds being turned up from their winter retreats, it is to be remarked, that they are always, or nearly always, upon hearsay, and doubtless have lost nothing in the transmission from one person to another. There is scarce an instance of a person describing such a circumstance from his own observation. "No man" says Gilbert White, a supporter of the theory, "no

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man pretends to have found any of them in a torpid state in the winter." (Letter XII). White himself dug out the nests of Sand-Martins from the holes in a bank, and satisfied himself that they were entirely deserted. Swallows are reported to have been found between roofs in the winter, which revived upon being brought to the fire. But such stories require the confirmation which we anticipate they will never receive, before they can be recognised as scientific truths. That it happens frequently that a bird has been seen long after his companions have quitted their summer residence, there can be no doubt — such a circumstance, indeed, is one of those exceptional cases which prove the rule. Some defect of flight may have prevented it from accompanying its congeners, and we may safely conclude, that such a bird, if it remained, would not be able to exist through the winter. Late broods of Swallows are not unfrequently left behind, if the impulse of migration come upon the parents before the young are ready to fly with them. In these cases, they are pitilessly deserted, and necessarily and rapidly perish, and their putrid carcases, or mouldering skeletons may be sometimes found on searching the nests in late autumn; but torpid and living birds, never.

Aristotle was much puzzled with the phenomena of migration, and besides accounting for the absence of some birds, by supposing that they hid themselves in holes, he imagined that others changed in their form and appearance at different seasons of the year. Thus he supposed the Redstart changed into the Redbreast, and the Blackcap into the Beccafico. But the fact was, that these birds appearing at alternate seasons, the one became visible just as the other took his departure, and hence arose the error. The country-folk of our own day have a similar notion, and we have been soberly informed, that in winter the Cuckoo changes into a Hawk, a popular error arising

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from the strong similarity existing between the Cuckoo and the female Sparrow-Hawk, which is really remarkable. Aristotle took pains to refute this very error.

The Stagyrite was not unacquainted however with the true causes of the phenomena of migration, and he knew that some birds, when they quitted him, visited warmer climates. Thus (Hist. An. l. viii. c. 12), he says, "Both the Swallow and the Turtle leave us to spend the winter in other climes." Even so far back as the days of Homer, indeed, some isolated facts were known, though no generalization was arrived at. Herodotus is the only ancient writer who gives us definite information on the subject; and in his invaluable second book, he tells us that Swallows and Kites continued all the year round about the springs of the Nile. Ælian also says, they remain in the northern latitude but six months. And it is surprising how few new facts have come to light in the twenty-three centuries which have elapsed between the time of Herodotus and the present. Up to about a century ago, we have seen that the majority of naturalists doubted the fact of Swallows quitting the country at all; and it was not until M. Adanson announced in his "Voyage to Senegal," that he had seen European Swallows in that locality in winter, that the matter was considered as demonstrated. He says, that late in 1749, European Swallows lodged on the vessel in which he travelled from Goree to Senegal, and that they are never seen there except at that time of the year, along with Quails, Wagtails, Kites, and some other birds of passage; and further, that they do not build their nests there. But this observation of Adanson's is open to many objections, and even in the last century, there were not wanting ornithological writers who attempted to prove that no reliance could be placed upon a general and vague remark made by a person, who however great might be his

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scientific acquirements in other respects, was himself no ornithologist. Gilbert White mentions his observation only to cast doubt upon it; and Daines Barrington wrote an elaborate paper in the 62nd vol. of the Philosophical Transactions, in which he proves pretty satisfactorily that M. Adanson had no specific knowledge of birds in general, nor of Swallows in particular, and that he probably mistook an African species for British Swallows. Although however it is highly probable, that the remark of Adanson is not entitled to the weight usually attributed to it, it does not militate against the fact that Swallows *do* migrate, and we must of course dissent from the conclusions which Barrington arrives at in the ingenious essay referred to, namely, that the Swallow tribe do not quit us, but remain in a torpid condition during the winter, in the immediate vicinity of those localities which they frequent in summer.*

There are a few references scattered through ancient writings, relating to the exact time of appearance or disappearance of some birds; and first, with regard to Swallows. These birds have in nearly all ages excited attention, and numerous are the allusions to them in ancient writings, from the φίλη χελιδὼν of Anacreon downwards. A mere list of them would be too long for this place, and it would be more easy to give a list of the writers who have omitted to mention these favourite birds. Herodotus is almost the only author who mentions Swallows as seen anywhere in winter, and he speaks positively of both Kites and Swallows wintering about the springs of the Nile; though of course we cannot be certain that these were our Swallows. It is remarkable that Anacreon, writing a hundred years earlier, suggests the same thing (Ode 32) —

* I would refer the reader for what I conceive to be the true principle of Migration, to an abstract of a paper upon that subject which I read before the British Association at Leeds, in 1858, which will be found in the Volume of Reports, and in the Athenæum, October 30, 1858. — C. C.

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Χειμῶνι δ' εἰς ἄφαντος,
Ἡ Νεῖλον, ἢ 'πὶ Μέμφιν.

According to Ptolemy, Swallows returned to Egypt (the Delta) about the latter end of January. Theophrastus (B.C. 320) in his Treatise on the Winds tells us, that between February 28 and March 12, the Ornithian winds blew and the Swallow re-appeared at Athens. These winds were called Ornithian, from their blowing at that time when the migratory birds began to make their appearance, and were (no doubt correctly) believed to assist them in their passage. They were also called Chelidonian winds, having special reference to the coming of the well-known Swallow. We thus trace these birds from their winter residence as far as Athens; and their passage to England and the more remote northern localities which they visit in summer, may no doubt be pretty correctly filled up by modern observations. Thus we find that they arrive at Rome March 3rd, at Bruges April 5th, and in England about April 15th, while the Swedish calendar of Alex. Berger, in the Amœnit. Academ. informs us that they are seen at Upsal, on 9th May; and they are even said to visit the southern parts of Siberia. Their arrival was, in ancient times, welcomed as the harbinger of spring:—

"jam veris prænuncia venit hirundo
Tum blandi soles.—Ovid.

and although we may in the present day eagerly look for the first Swallow as a ratification of the opening season, there is no doubt that our enthusiasm was exceeded by the ancients. They greeted him with a song; and the Swallow-song or χελιδόνισμα which the Rhodian boys sang, going about in troops from door to door, with a captive bird in their hand, has been preserved by Athenæus (viii. 60). It begins

Ηνθ' 'ἦνθε χελιδὼν —

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"The swallow is come!
The swallow is come!
O fair are the seasons, and light
Are the days that she brings
With her dusky wings,
And her bosom snowy white."

The whole song contains nineteen lines in the original.

But although the ancients regarded the Swallow as the harbinger of spring, they well knew that it was *only* a harbinger. The fact that a Swallow or two will make its appearance prematurely, and be forced to withdraw for a time from the inclement season into which it had ventured, was doubtless observed by them; and perhaps no proverb is more universal, or more ancient, than that homely one, that "one Swallow does not make a summer." It was known, and moreover in precisely the same words (spring being substituted for summer), to the Greeks and Romans, and is used by Aristotle and Horace; and doubtless Aristophanes referred to it, or the observation which gave rise to it, when Peisthetærus says (in the Birds l. 1415). "He seems to me to sing a song for his own coat, which is so threadbare, that he has need of not a few Swallows" (*i.e.* to keep him warm). Besides the English—the French, Germans, Dutch, Swedes, Spanish, Italians, and other nations, use the proverb in precisely the same terms.

The Cuckoo was another bird much observed and well known. The Greeks called it the "Turtle-Leader," from its arriving shortly before the Turtle-Dove, just as our own countryfolk at this day call the Wryneck the "Cuckoo's Mate." The note of the Cuckoo, according to Aristophanes (Birds, l. 505), was the signal to the Phœnicians to reap; but Hesiod tells us (Works and Days, 484), that the Cuckoo came to Greece just as the husbandman had finished ploughing. Hence, perhaps, Horace (Sat. I. vii., 30) makes a passer-by call "cuckoo" to a lazy vine-

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dresser. According to Aristotle, who had noticed the failure of its vocal powers (Hist. Anim. ix. 49), the Cuckoo disappeared at the rising of the dog-star ("canem illum, invisum agricolis sidus," as Horace calls it in the Satire referred to), that is, towards the end of July; and this is confirmed by Theophrastus, who tells us that the Cuckoo disappeared at Athens, July 30th. The parasitic habit of the bird was well known to Aristotle, who says (lib. ix. c. 29), "that the Cuckoo does not build a nest itself, but most commonly makes use of that of the Wood-Pigeon, Hedge-Sparrow, and Lark, which are built on the ground, as well as the Greenfinch, whose nests are in trees." Considering when this extraordinary man lived (he was a pupil of Plato, and preceptor to Alexander the Great), it is really astonishing how much of truth there is in his remarks; for except that the Wood-Pigeon (if our British species be meant) does not build on the ground, nor do we usually find Cuckoo's eggs in its nest, the statement is quite correct. Moreover, the great naturalist was aware that some species of Cuckoo built a nest for itself. The parasitic habit of *our* Cuckoo is incontestable, and the Hedge-Sparrow is most commonly the dupe, although Daines Barrington, an accomplished naturalist of the last century, has been at some pains to prove that Aristotle was altogether wrong. His paper upon this subject will be found in the 62nd vol. of the Phil. Trans.

Between March 11th and 26th, says Theophrastus, the Kite and Nightingale appear. Kites and Swallows are usually mentioned as arriving together, as by Herodotus above; and the same circumstance is remarked in the Calendars of Geminus (B. C. 57. Phenomena), and Ptolemy. Homer (Odyssey xix. 519) connects the Nightingale's voice with returning spring — *ἔαρος ἱσταμένοιο*. Quails arrived at Athens, August 19th, according to Theophrastus; and Cranes Sept. 20, indicating, says Hesiod, the

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season of ploughing and the time of rain. This same season, Virgil informs us (Georgic I.) was denoted at Rome by the raven —

"Tum cornix plenâ pluviam vocat improba voce."

It is not surprising that the ancients were well acquainted with the remarkable habit some birds have of performing their periodical flight, ranged in a more or less regular figure. Cicero alludes to it (de Nat. Deor. ii. 49). Such a singular appearance as is presented by a number of large birds, impelled as it were by a single will, floating away in an unbroken figure, through the higher regions of the atmosphere to their mysterious destination, is striking in the extreme, and sets the spectator musing upon the wondrous instinct which guides them, and the marvellous regularity of the uninterrupted lines which they then assume, and which fade away in the distant horizon, till they appear like a spider's thread, never losing their wonderful symmetry and distinctness of outline, till the failing eyesight can follow their track no longer. What the object of this symmetrical arrangement really is, it is difficult to say. Buffon imagined, that the strongest naturally keeps in front, and the others are necessarily obliged to follow behind, but this would by no means account for the perfect regularity of their flight. The probability is, that Cicero's explanation, in the passage referred to, is the correct one, and that when flying in large bodies, they assume the V form, from an instinctive knowledge that it offers less resistance to their rapid flight; and one, possibly a strong-pinioned bird, is selected by them as their leader, though it is probable, that in turn, he gives place to others during their progress.

Certain customs relating to birds, and commonly regarded as modern, are nevertheless of very ancient date.

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Thus the habit gamekeepers have of nailing up their spoil against a barn-door, must have been remarked by every one. Not only are vermin, such as weasels, stoats, and polecats, thus impaled, but a stray Crow, or an unhappy Magpie, or even nobler birds, if they have roused the guardian's jealousy for the safety of his game, swell the number of his trophies. Such a collection was aptly called by Gilbert White, "the countryman's museum." This method of disposing of such evil creatures is perhaps a remnant of that custom which Apuleius mentions; (Metamorph, lib. 3.) "Why do we not see that these birds of night, when they have got into any house, are eagerly seized and nailed to the doors, in order that they may atone, by their torments, for the evil destiny which they portend to the family by their inauspicious flight?"

The common and popular schoolboy's joke, of sending a new comer for *Pigeon's milk*, might possibly be considered as essentially English, did we not know that the expression "bird's milk" (*ὀρνίθων γάλα*) was of great antiquity. It was used, anciently, to imply some extraordinary good fortune, or some marvellous and unheard-of dainty, and is found several times in Aristophanes, as in the Wasps (508, &c.) The same thing was also implied by the term "ass's wool" (*ὄνου πόκοι*), which expression is used by Charon, in the Frogs (186). The connection in which "bird's milk" is used by Aristophanes, may be best judged of from a passage in the Birds, which also shows the esteem in which the feathered race was held —

> All gifts we bring to you —
> Wealth and peace, and flowing treasure;
> Health, and joy, and youth, and pleasure;
> Love and laughter, smiles and silk;
> Song, feast, dance, and *pigeon's milk*.
> Aves: Act i. sc. 6 (Cary's trans.)

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It is to be borne in mind however, that modern science has, to a certain degree, converted the ancient joke into a sober truth, and while "bird's milk" was a poetic licence, the restricted form of it, which we employ, is a physiological fact. It was John Hunter, who experimenting upon the crop of the pigeon, discovered, that during the breeding season, it takes on a secreting function for the purpose of supplying the young pigeons, in the callow state, with a diet suitable to their tender condition. An abundant secretion of a milky fluid, of an ash-grey colour, which coagulates with acid, and forms curd, is poured out into the crop, and mixed with the macerating grains. This phenomenon is the nearest approach in the class of birds to the great characteristic function, the presence of whose special apparatus, the mammæ, has afforded the universally recognised title of the higher division of warm-blooded vertebrata. (Owen: Art. Aves, in Todd's Cyclopedia, i. 318).

SIXTH ORDINARY MEETING.

ROYAL INSTITUTION, 10th January, 1859.

THOMAS C. ARCHER, ESQ., V.P. in the Chair.

The following were elected Ordinary Members:—

Mr. JOHN M'ANDREW,

Mr. ROBERT GORDON HAMILTON, and

Mr. RICHARD STUART.

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The attention of the meeting was drawn by Mr. BROOKE, to the question of the species of Elephant used by the Carthagenians.*

Mr. MORTON exhibited several fossil teeth, two of which bore evidence of diseased structure.

Mr. ARCHER exhibited specimens of the *Turbinella pyrum*, converted into papboats by the natives of the Philippines.

The following paper was then read—

ON THE CORRELATION AND CONSERVATION OF PHYSICAL FORCE AND ITS ASSOCIATION WITH MATTER.

BY JOHN BAKER EDWARDS, Ph.D., F.C.S.

FEW philosophers have studied more profoundly the nature of matter, and the agencies affecting its change, than Sir Isaac Newton. So great was the impression made upon the mind of this eminent philosopher of the necessary minuteness of the ultimate atoms of matter, and the large amount of interstitial space occupied by attractive or repellant force, that he hazarded the conjecture, that if the entire mass of the earth could be so compressed as to bring the atoms into one solid mass, destitute of pores, it is probable that the space occupied would not exceed *one cubic inch*.

* Polybius (Lib. v.), in his description of a combat between Ptolomy and Antiochis, notices the use of the Elephant, and remarks, "But the greatest par of Ptolomes feared the combate: the which doth usually happen to the Elephants of Lybia. For they cannot indure the sent, nor heare the crye of those of India. So as fearing (as it seemes) their greatnesse and force, they flye them, as it happened at that time, for that flying suddainly they brake the rankes of their owne men, and made a great slaughter in Ptolome's great battallion."—Grimeston's Ed. 1644. Fol. p. 268.—[EDITOR.]

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However wild such a conjecture may appear to us, our ordinary notions of solidity, founded on the impressions made upon our external senses, are doubtless very erroneous, and ample proof exists, that in every mass, however apparently solid, large interstitial spaces exist, in which a force acts in opposition to that of simple attraction.

What the precise nature of this force may be is not determined, it is by some called repulsion, by others heat, by others electricity. Some consider that different agencies act thus on different bodies, others think that the primary force is in all cases the same, and that heat, electricity and affinity, are external agencies called forth by a juncture of favourable conditions. Modern researches tend to establish the theory, that matter, whether simple or compound, is naturally associated in definite proportion with force, and that this force, when disturbed, may assume the form either of motion, light, heat, or electricity.

The physical properties of matter are commonly referred to the inherent nature of the true atoms, of which a mass is composed. It would, however, be probably more correct to refer them entirely to the mode in which matter is associated with force. The chemist is satisfied when he has resolved a compound into two or three substances, the ponderable particles of which are alike in nature. These he considers elementary, and of such kind of matter he finds some sixty-three substances which he calls elements. The physicist must advance a step farther, and inquire, how does this matter associate itself with force? These elements are not always found in the same physical condition. In fact, masses consisting of the same elementary atoms, may differ from each other in nearly every physical property; and this seems only to be accounted for by assuming, that

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while the elementary matter is in each variety identical, its mode of association with force widely differs.

Illustrations of these facts I shall now lay before you.

There is perhaps no element with which we are better acquainted than with oxygen.

It has been made the subject of almost perpetual experiment; it is most widely diffused in its combinations with other elements; it is the most important constituent of our atmosphere, and the standard from which Continental chemists take their atomic weights. It is found, however, that it exists in three very different conditions, two of which have been long unobserved. Professor Schonbein is the discoverer of these new forms of oxygen, which he calls ozone and ana-ozone.

Ozone is formed when the electric spark is passed through oxygen or air; also, by the slow oxidation of phosphorus in air or oxygen. It has not been isolated, but oxygen has been converted into ozone, to the extent of one-fourth of its volume. The new product has a powerful odour, and possesses extremely exalted chemical properties, oxidizing metals, bleaching indigo, setting free iodine from iodide of potassium, &c. It exists in the atmosphere, especially in the sea-breeze and in hilly districts. It is absent from the atmosphere of large and crowded towns. It is an active agent in rapidly completing putrefactive change, and observations on its presence are now being extensively made in reference to the comparative healthiness of different localities, which it is said greatly to promote.

Anozone is an opposite condition of the same body, and when added to ozone destroys its character, and converts it into ordinary oxygen.

Professor Andrews of Belfast, has not only enlarged our knowledge of ozone, but by a series of elaborate and skilful experiments established the interesting fact, that

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analagous modifications of the elements, chlorine, bromine, and iodine exist; all of which exhibit in a highly exalted degree the chemical properties of their derivatives, and are readily convertible into the common forms.

There are various modes of considering these new elements. Oxygen may be, O + heat, ozone, O + electricity; or oxygen may be composed of *simple atoms*, and ozone of *conjugated atoms;* but in either case the nature of the elementary matter is the same, and its new characters are probably due to different associations with force.

Sulphur exists in two crystalline and in two amorphous conditions.

This body melts at a very low temperature, and when melted readily inflames in the air, when allowed to cool it forms a crystalline mass, having the figure of an oblique prism.

It dissolves in bisulphide of carbon and benzine, and crystallizes from these solutions in the form of an octohedron with a rhombic base.

Amorphous sulphur is formed by the continued action of heat upon melted sulphur, when from a very fluid it becomes a highly viscous semi-solid mass, which on sudden cooling becomes a soft solid, retaining its transparent and flexible properties for some days.

It is of less specific gravity than the opaque variety into which it gradually passes with loss of heat.

Phosphorus is another remarkable example, and exists in no less than five different states. It undergoes a somewhat similar change to sulphur when heated above its melting point, and forms rhomboidal dodecahedrons when crystallized from its solution in naphtha.

In the ordinary condition, Phosphorus is a soft translucent solid, fuming and oxidizing in the air at ordinary temperatures, the fumes being luminous in the dark. It fuses at 112° F, at or about which temperature it takes

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fire spontaneously in the air. It dissolves freely in bisulphuret of carbon and benzine.

In one of the other conditions called Schrotter's phosphorus, or amorphous phosphorus, it is a red opaque powder or mass, does not fume in the air, does not fuse below a temperature of 500° F, at which point it melts suddenly, and in the air bursts into a flame, being converted into ordinary phosphoric acid. If the air be excluded it does not burn, but passes into the ordinary condition again. It may be freely handled, possesses *no luminous* property, is *insoluble* in naphtha, bisulphide of carbon, &c.

This substance derives great interest from the endeavour which has been made to introduce it into use, in lieu of the ordinary phosphorus, in the manufacture of lucifer matches.

I believe in the better kind of matches, such as wax vestas, &c., it is now largely employed, but it does not by any means supplant at present the common phosphorus, being more expensive. On the score of humanity, however, its adoption would be very desirable, for the fumes arising from the dipping pan in the ordinary process produce a distressing form of caries of the lower jaw, which often results in the entire loss of that bone, when workmen of scrofulous habit are employed in this process of the manufacture. The evil is entirely avoided by the use of Schrotter's phosphorus.

Carbon, boron and silicon, offer corresponding examples.

As diamond, carbon is the hardest of crystals; a non-conductor of heat and electricity, capable of absorbing and emitting light, and of burning only at an exceedingly high temperature.

As plumbago, as coke, as charcoal, as soot, as animal charcoal, we have carbon still chemically pure, but pre-

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senting the utmost variety of physical characters, and possessing contrasting properties with respect to light, heat, and electricity.

Boron and silicon have been recently ascertained each to exist in three very different conditions: one of which is crystalline, like the diamond, and extremely hard; the other forms have some resemblance to graphite and charcoal.

Many other examples might be quoted, but probably the instances given will suffice to show, that the same chemical atoms unite themselves together to form defined varieties of the same body, extremely unlike in their physical characters, and differing also in their chemical powers and combinations.

It is now our object to inquire what is the nature of the force thus combined with matter.

External heat appears to be an agent in producing an increase of latent force, and seems to be absorbed by a solid during expansion, in a greater ratio than is indicated by mere change of temperature.

Heat, again, is the agent by the absorption of which the solid assumes the liquid, and anon the gaseous condition. The latent force is therefore regarded by some as *latent heat.*

It is natural to assume that the radiant force which acts upon the atoms of solids, preventing contact, and preserving them at definite distances in solids, giving fixed characters and forms to their masses, and by combining in different ratios, producing polymorphic forms of the same elements, is identical with the force which is employed in the expansion of bodies, and in that change of condition from the solid to the liquid or gaseous state, commonly attributed to "heat of fluidity," or *latent heat.*

During the change of state in a liquid, we observe that it undergoes a loss of heat in assuming the solid form; and again, that heat is absorbed from other bodies during

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the restoration of the mass to its previous condition. But we cannot recognise *heat as such*, during its *latent state;* is it, then, converted into some other form of force? If so, is it what we then call "gravitation?"—*i. e.*, "attraction of mass."

The allatropic condition of matter is observed not only in elementary substances, but also in compounds and salts, and remarkable phenomena frequently accompany a sudden change of state.

Iodide of mercury changes by friction from one form of crystallization to another, accompanied by striking alteration in colour — thus, *yellow* iodide is converted into *red* iodide, and *red* reconverted by heat into *yellow*.

Sulphide of mercury is precipitated *black* by sulphide of ammonium, but a *red* sulphide is formed by the action of per-sulphide of potassium upon metallic mercury. The *red* sulphide (vermilion) is converted by heat into the *black* sulphide; the latter is reconverted into *red* by friction. Sulphide of antimony also exhibits an *orange* and *black* variety. Chromate of lead is found both in *yellow* and *red* conditions.

Arsenious acid exhibits a remarkable change, which goes on spontaneously. When first sublimed it is perfectly pellucid, like glass, but gradually it becomes opaque in layers throughout its mass, exhibiting a striated appearance, until the whole becomes converted into the opaque white variety, the change often requiring years to complete. The pellucid acid is the most soluble, and when its solution is allowed to crystallize, a flash of *light* accompanies the deposition of each crystal, which is then found to be of the opaque variety, and which, when redissolved, recrystallizes *without any appearance of light.*

We might infer from these examples of dichromism and of emission of light, that this agent, light, was, in some instances, definitely combined with matter.

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The act of crystallization is generally greatly influenced by light, and many examples may be quoted in which light is evolved at the moment of the formation of the crystal. Heat is also usually evolved as the body loses its *latent heat of solution*, in passing from the liquid to the solid form.

A striking example is shown by the substance called plate sulphate of potash. At its crystallizing point, this solution, when poured into a cold vat, becomes brilliantly luminous, and flashes of light are seen on the sides of the vessel, which for an instant light up the interior. When the hot liquid is stirred with a cold rod, or cold water dashed into it, a similar phenomenon occurs.

Either, therefore, in the act of crystallization, the body yields *latent light* previously in combination, or a portion of the *latent heat* is thrown off in the active condition as *light*.

Camphor preserved in transparent bottles, vaporises and crystallizes on the sides of the glass most exposed to light.

Chemical affinity may be regarded as a property of matter, or as a force called into existence at the moment of union between elements. The recent theory of homogeneous affinity affirms, that this force is perpetually exerted between like as well as unlike atoms, and by associating its parts into new molecules, it forms those allatropic varieties of elements whose nature we have just discussed.

It was formerly supposed that only a very few bodies were affected by the magnet; it is now however known, that all bodies are more or less affected by it, and that those which are not attracted by it are repelled.

Bodies are therefore either magnetic or diamagnetic in relation to each other; and scarcely can any two surfaces come in contact without electrical disturbance.

Now the physical condition of a body affects its reception and retention of magnetic force.

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Soft steel will not retain its magnetism, but after being annealed or tempered, its retentive power is remarkable; a red heat entirely dispels the magnetism, and the steel again requires tempering in order to be remagnetised.

Heat is, moreover, a great obstacle to the passage of current electricity through a conducting body.

While thus the study of elementary matter leads us to the conclusion that some definite laws in relation to the combination of matter and force must exist, which are at present unknown or obscure, the advances of organic chemistry lead us to the same conclusion from an opposite point. For while here we see that the same atoms combine to form different masses, which tends to threaten the great physical law, "that no change of properties can occur without a change of composition." On the other hand, in our "Organic radicals," we recognize compound molecules having the features and enjoying the properties of elements, both of the metal and metalloid series; and in the "doctrine of types," and of "substitution compounds," we plainly see that a new kind of atom supplied to a substitution compound, but slightly affects its properties so long as the general type of Matter + Force is maintained: for so-called electro-negative elements replace electro-positive elements, and *vice versa*, without any material change of character to the compound, contrary to the other aphorism, "that a change in composition produces a change of properties."

Unquestionably in the latter class of compounds we must consider the amount and nature of the *force* as an important constituent of the *type*.

Let us now turn to the consideration of the nature of Force, and examine the arguments in favour of its unity, under the varied developments of light, heat, electricity, affinity, and neuralicity.

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One of the ablest expounders and originators of these views is Professor Grove, who, in his work "On the Correlation of Physical Forces," ably sustains and illustrates the subject. He considers that these forces are modified modes of motion.

The following experiment may illustrate the subject:—

Let the flame of a spirit lamp be applied to a pile of antimony and bismuth bars; first heat, then expansion (motion) results: let a circuit now be formed, including fine platinum wire; the latter becomes heated to redness. We obtain thus, result = *Heat*. In the place of the wire, place charcoal points, and we have the phenomenon of = *Light*. Substitute for the charcoal a voltameter, and we obtain chemical decomposition = *Affinity*. And, lastly, employ an electro-magnet, and we obtain = *Magnetism* and *Motion*.

The combustion (affinity) may be here considered as the cause of the resulting phenomena, but remove the lamp and apply a red-hot poker to the bars and simple *heat* appears to be the primary cause; but if we remove the pile, and apply solvents to the voltaic battery, *affinity* is again the excitant.

Start with a permanent magnet and rotate a helix before its poles, *electricity* then produces all the original phenomena.

Start then with a ray of pure white light, let it fall upon a prepared Daguerreotype plate, and under proper observation, *affinity*, *heat*, *magnetism*, and *motion* still result.

Each of these forces may thus be made the apparent cause of a series of similar phenomena.

Both as a result and an excitant of some of these forces, neuricity or nerve force appears to be a member of the group. Muscular contraction is a result of the direct action of *light* upon the iris; it is also produced by *heat*, when applied as a cautery, and by *electricity*, by aid of

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the induction coil; these forces also act under some circumstances in an opposite manner, viz. — by relaxing the muscles, &c. On the other hand, the direct result of muscular action is proved to be electrical and magnetic, while the destruction of tissue attending every muscular effort involves chemical action (affinity).

The extraordinary phenomena of electric power exhibited in the gymnotus and torpedo cannot strictly be considered as the result of chemical action. The power of these animals to renew the shocks is quite voluntary, but after a time they become exhausted by the exercise, not by loss of electrical material, but of vital power; they become faint and require some rest to renew their energies after a battle, and many die from syncope. This appears to me to prove that the electrical power is derived from vital power, by a direct conversion of vital into magnetic force.

The same argument applies to the phenomenon of light exhibited by a much larger number of animals; as the glow-worm, fire-fly, medusæ, &c., &c. This appears to be exhibited at will, and especially under irritation, but if the excitement is too frequently applied it fails to reproduce the effect, the vital force of the animal is exhausted by frequent exercise, and it becomes incapable of the necessary effort.

The phenomena of phosphorescence exhibited by crustaceans, zoophytes, and acalephæ, shortly *after* death, becomes an interesting inquiry in this connection. Invertebrate animals appear to have a very *diffused vitality*, and it is probably very difficult to say at what period the parts really die. When death occurs, doubtless chemical decomposition commences, as the latter is restrained while vitality exists. Is the phenomenon of phosphorescence the commencement of chemical decomposition, or the visible departure of vitality? No facts have been observed, proving that the effect is due to combustion,

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or to the oxidation of any known gases, and the appearance is very unlike that usually exhibited by chemical action.

It does not always proceed with the putrefactive change, but often disappears before this becomes apparent. Fish —salmon, mackerel, and sprats for example, only exhibit this luminious appearance while fresh, and they frequently are observed to exhibit it also *during life*, when swimming in large shoals.

Heat, as a result of vital force, by the agency of affinity in the combustion of carbon, is of course a familiar physiological fact.

M. Helmholtz, in considering the conservation of force, includes animal force in his review, and asserts that the gain of vis viva during the motion of a system is equal to the amount of force consumed in producing it; the sum of the two is therefore constant.

Professor Faraday, in an able lecture on this subject, considers the difficulties which he perceives in reconciling the usual expression of the laws of gravitation with this conservation, and these laws appear to him improperly to exclude that force from the correlated group to which he considers it ought certainly to belong. He affirms, that force is convertible, but definite in amount, and that a creation or destruction of force would be an act equivalent to that of the creation or destruction of matter.

Professor William Thomson expresses force as existing in two forms, actual and potential.

The energy of motion is *actual energy*. The store of energy in a material by means of which it can get into motion is *potential energy*.

For example, the actual energy of war is in the men and the horses; the potential energy is in the gunpowder and the food.

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The heat, sound, and mechanical power of the gunpowder, are altogether the equivalents of the chemical affinity of its elements.

The vital and mechanical powers of both horses and men, are the equivalents of the chemical combustion of the food they eat and the oxygen they breathe. The heat, light, and mechanical power we obtain from coal has been stored up for ages as potential energy, derived from the radiance of a primeval sun, while from our green wood fires we recal perchance at Christmas the sunny beams of June.

So far from agreeing with the doubts raised by Professor Faraday, Dr. Thomson suggests that the potential energy of gravitation may be in reality the ultimate created antecedent of all the motion, heat and light, at present in the universe.

Force, thus considered, is like matter indestructible, constant in its quantity, however varying in its expression.

It is doubtful whether under any circumstances force can be said to be at rest, or motionless; as free light, heat and electricity, it is well known to possess definite and constant vibration, and some consider that in the form of latent heat, affinity, and gravity, motion is still perpetuated. According to this view, the ultimate particles of matter, even in the most solid mass, are in a state of restless activity, and perpetual change of place and association.

The emanations of light, heat, and affinity from the sun, must on the material theory be considered as a direct loss to that body. M. Pouillet has calculated, that the quantity of heat given out during a year by the sun, is equal to the amount which would be obtained by the combustion of a stratum of coal, over its entire surface of seventeen miles in thickness.

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Conjecture has been busy to conceive by what means such a loss could be sustained.

The theory that this may result from the gradual condensation of the sun's mass, has been received with favour, and it is estimated that condensation to the extent of one-ten-thousandth part of the sun's diameter would furnish us with such a supply of heat as we now enjoy for a period of two thousand years.

The actinism or affinity which accompanies light is a most interesting subject of investigation, it has been generally associated with the rays at the violet end of the spectrum, but is found in greatest power in a dark band beyond that point; actinic rays are therefore *non-luminous*, although they are doubtless allied to light, and probably convertible with it. The study of what is called epipolic dispersion of light has advanced this subject, we find that a solution of quinine which freely transmits luminous rays of white light, entirely refracts actinic rays to its surface, so that none pass.

Terrestrial light has usually very feeble actinic power; but a chemical fuse of great power has been lately discovered, which is employed for photographic purposes, and is as powerful as daylight. The electric light is by no means remarkable for actinic power. Light appears to be absorbed by certain gems, such as the diamond and emerald, and re-emitted in the dark; these soon radiate all the light absorbed, and require to be again exposed to the sun's rays in order to repeat the phenomenon. All white objects thus radiate a portion of the light they absorb, while dark and black objects probably absorb altogether the luminous rays. This is not the case with actinic rays, which become absorbed and re-radiated from all kinds of matter, so that one coin cannot be laid upon another in the dark, without an image being mutually transferred from one to the other; these images are not visible unless a

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developing agent be employed to render them so, and they are not very permanent. The amount of actinic force absorbed by white paper is so considerable, that a new photographic process of some convenience is founded thereon.

The paper appears to contain an amount of normal light of low intensity, which must first be removed. This is accomplished by laying the sheets in a dark room, when the paper slowly radiates its absorbed light, and becomes so to speak "empty." It is then exposed to the sun's rays, and receives therefrom, a surcharge of active actinism, which it retains for some hours in a condition of sufficient intensity to transfer the image from a print or paper negative to the prepared photographic paper.

The conclusions I would draw from the foregoing considerations, are the following, viz. —

That force is an independent principle and not a property of matter. That it is definite in its amount but varied in its manifestations. That it is in a condition of constant activity and is exerted alike during the changes which affect matter, and in maintaining it in a condition of apparent rest, as exhibited in forms of attraction, such as cohesion, adhesion, capillary, crystalline, chemical, and magnetic attractions, as well as in the repulsive or radiant forces of heat, light, and electricity. That vital force is another of its manifestations, and motion the mode of its action rather than its cause. That the combinations of matter with force are definite, and determine both the physical and chemical nature of masses, and as we are only acquainted with matter in such combinations, its true elementary character is yet unknown to us. Future discovery may still confirm the dreams of speculative philosophers in all ages, as to the probable unity of the nature of primary matter, while the tendency of our present facts is to establish the unity of Force.

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SEVENTH ORDINARY MEETING.

ROYAL INSTITUTION, 24th January, 1859.

The REV. H. H. HIGGINS, M.A., Sen. V.P. in the Chair.

The resignations of Mr. HUGH NEILL and Mr. GOODWIN were received and accepted.

The members inspected a valuable collection of chemical preparations, presented to the museum by Dr. SQUIRE.

Mr. ANDREW exhibited a proteus which he had brought from the grotto at Adelsberg.

Mr. HIGGINS submitted a good specimen of the *Venus mercenaria*, an American species, which had been found on the Bootle shore, thrown there probably with ballast.

Mr. HIGGINSON referred to Professor Owen's experience of the Elaud antelope as an article of food.

The Rev. HENRY H. HIGGINS, M.A., then read the paper on "GASTEROMYCETES," which will be found printed in the Appendix to this volume.

EIGHTH ORDINARY MEETING.

ROYAL INSTITUTION, 7th February, 1859.

The REV. H. H. HIGGINS, M.A., Sen. V.P. in the Chair.

Mr. RICHARD BROOKE described the habits of the Elaud antelope, as he had observed them in the collection of Lord Hill, at Hawkstone.

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Mr. ARCHER quoted an account of the destruction of bees by fungi, in confirmation of the chairman's views, explained to the Society during the last session.

Dr. EDWARDS exhibited Warrington's microscope.

The paper for the evening was then read —

INVESTIGATION OF THE CAUSES OF LOCAL PECULIARITIES OF TEMPERATURE IN DIFFERENT PARTS OF GREAT BRITAIN.

BY JAMES ELLIOT,
PROFESSOR OF MATHEMATICS, QUEEN'S COLLEGE.

IT is well known that the temperature of the northern hemisphere and that of the southern are very different; and it is equally well known, that in both hemispheres, but particularly in the northern, the isothermal lines are by no means coincident with the parallels of latitude — that is, that different places equidistant from the equator have not the same warmth of climate, and consequently that local temperature is not due solely to the degree of obliquity in the incidence of the solar rays. Neither do places in the same latitude differ only in the *mean rate* of temperature, but also in its *fluctuations* and its *range*.

One of the principal causes of difference in the mean temperature, apart from latitude, is the influence of particular winds, according as the current from the equator or that from the nearest pole prevails; but since this inquiry is confined to the limits of our own island, that cause need not be considered, the direction of the wind differing slightly over an extent of surface so limited and so situated, except in the case of local eddies, which,

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while they divert the wind from its leading direction, do not alter its temperature. But even within narrow bounds, it is well known that differences of temperature exist between places in the same latitude. The causes of such differences it is my present object to investigate. Some of those causes are already well known, while others, it is believed, have not been sufficiently appreciated.

Before we inquire what *are* the causes, let us first clear the ground of those which have been *falsely* assigned.

1. *The proximity of mountain ridges*, whatever may be their height, has no effect in lowering the temperature of the atmosphere in the adjacent country. The opinion so common, that low-lying valleys may have their temperature materially reduced by the contiguity of snow-covered mountains, is not merely a popular fallacy, but has found a place in philosophic discussions. A little consideration, however, will show that it *is* a fallacy. It is not the mountain top which cools the atmosphere passing over it, but the atmosphere itself which cools the mountain top, or rather keeps it in its comparatively colder condition. The air which blows over an elevated range, must previously have ascended from the lower level: air in ascending, expands, and in expanding cools. The very same atmosphere which is warm in the lower region is cold in the upper. The wind which blows with a freezing effect over the summits of the Alps or the Pyrenees, is the very same which has previously refreshed the orange blossoms, or ripened the grapes on the basking plains of Italy or Spain, and which again descends as a warm south wind on France or Germany. At its highest elevation it is not made a whit colder from its contact with the never-melting snows, and no more is it warmed as it passes over the sultry valleys; for the higher ground is itself, on an

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average, at no lower temperature than is naturally due to the expanded atmosphere of the upper region, nor is the lower ground at a higher temperature than the air itself would attain, on the same level, from its comparative density. If the air, in expanding, has its temperature lowered; conversely, when it again descends to its original level, and regains its former density, it returns to the same warmth, nothing abated by the lower temperature through which it has passed in the interval. It cannot at once cool the mountain top and be cooled by it; neither can it warm the plain, and at the same time carry off its heat.

When the mountain ridge is *in view of* the lower plain, some effect may, without doubt, be produced by direct radiation; but such an effect is too insignificant to be of much consequence, unless in some very peculiar cases, even if it were not fully compensated by a cause presently to be described. The insignificance of effect arises from the circumstance, that the angular elevation of a mountain top, as seen from the adjacent districts, is, in almost every case, very small. Mount Blanc itself, the painter dares not raise much above the horizon, however willing to please the popular taste, by giving it a towering height. Still the effect would be perceptible were it not for the following reasons: — If the mountain is very high, and the atmosphere cloudy, the clouds usually intercept the view of the summit, and, consequently, all direct radiation from it; but if the clouds are higher than the mountain top, they are also usually colder, and the mountain, cold as it is, becomes the warmest object in the direction in which it is seen, and therefore less is lost by radiation than would be lost if the mountain were removed. If the atmosphere is cloudless, the clear sky is colder than even the elevated clouds would have been, and the mountain is still more a protection from the cold.

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With this theory facts agree. There are sultry valleys in Switzerland, close to the highest mountains; and, in Scotland, walnuts ripen at the foot of the Grampians.

Having thus, I think, demonstrated that the wind is not cooled by passing over higher ground, I shall afterwards show that it may be, and often is, very much warmed by doing so, as an *indirect* result entirely unconnected with the previous considerations.

2. *The clearness or cloudiness of the sky* has *no* effect on the *mean* temperature. The *fluctuations* of temperature will, no doubt, be greater and more sudden under a clear than under a cloudy sky; the *difference* of temperature between day and night will be much greater, but the *mean* temperature will be the same; for if the clouds exclude the sun's rays by day, they also prevent radiation from the earth's surface by night.

3. *The material of which the surface of the ground consists*, or with which it is covered, although it also sensibly affects the *fluctuations* of temperature, has no influence on its *mean rate*, in as far as the radiating power of the surface is concerned, or its power of more or less rapidly absorbing the sun's rays. The sandy desert, the ploughed field, the forest, and the grassy sward, are in this respect alike in their influence on the average temperature. If the surfaces which radiate most are most cooled by night, they exactly compensate for it by absorbing the solar heat more readily by day. — *Monstrous!*

I may now proceed to consider *the causes which really do influence local temperature.*

The *first* of these causes is well understood. It is *difference of elevation.* The exact amount of its influence has been variously estimated; but we shall not be far from the mean of numerous observations, if we say, in round numbers, that the temperature diminishes one degree of Fahrenheit for every three hundred feet of

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altitude, being nearly the same effect as that due to a difference of one degree of latitude in this island. At this rate, the highest land in Britain will be, on an average, about fourteen and a half degrees colder than the sea-shore in the same latitude.

The *second* cause is *the direction* towards which the ground slopes. But this affects the heat of the soil rather than that of the atmosphere. Every degree of inclination more towards the south or towards the north, ought to make a difference in the heat received directly from the sun's rays, exactly equal to a degree of difference in latitude. But since such slopes are usually too limited in extent to warm or cool the atmosphere passing over them, unless in very calm weather, or in sheltered situations, the temperature of the soil only is affected; and that to no great degree, since the currents of the atmosphere constantly tend to restore an equilibrium. Any effect that is produced is of little value, since it continues only during sunshine, and ceases by night or in cloudy weather — that is, when it would be most useful.

The *third* cause is *shelter*. Shelter alone has no effect on the temperature. It abates the force of the wind and alleviates its cooling effect on any heated substance, as the human body; but it makes no change in the height of the thermometer. When this cause, however, is combined with the preceding, its effect over a limited area must be very great. We shall take, for instance, a garden, or other plot of ground, sloping to the south and sheltered on the north, north-east, and north-west, by high walls, hedges, or trees, but open in all other directions: there is no doubt that the temperature of such a spot might be very much raised above the temperature of the neighbourhood; probably, at particular times, to the amount of fifteen or twenty degrees above

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that of other spots dissimilarly situated; and not merely the temperature of the soil, walls, &c., directly exposed to the sun's rays, but that of the atmosphere itself. I have accidentally observed a difference of ten degrees, when all these favouring circumstances were *not* combined to their utmost extent, and with the thermometer sheltered from the reflected as well as the direct rays of the sun; and I have little doubt, the difference might be raised much higher, by having the local peculiarities carefully designed for the purpose. The shelter should, of course, be most complete on that side from which the coldest winds usually blow—that is, in our country, on the north-east. Such an artificial climate, however, cannot but be confined within narrow limits; and as soon as those limits are passed, we must enter a climate of exactly the opposite description. It may give rise to the warmth of some particular spots, surrounded by hills on every side but the south, and particularly when there is also a slope towards the south; but neither this, nor any cause yet mentioned, seems adequate to explaining why the winds blow so soft and mild on certain happy spots, such as Rothesay and Torquay, and how it happens that places a few miles apart, similar in regard to exposure, shelter, and elevation, differ in their average temperature by several degrees.

A *fourth* cause of difference of local temperature in islands and other places not remote from the sea, is *the prevalence of some peculiar warm or cold current in the ocean.* Such a cause is said to operate to a considerable degree on the north-west and west of the British isles. What is called the Gulf Stream, originating within the tropics in a westerly direction, from causes well understood, and turning northward as it approached the American coast, and thence eastward, and south-eastward as it draws near Europe, is said to raise all the western coast of the latter

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continent above the temperature it would otherwise have, and the west coast of Scotland and Ireland in particular. This makes the climate of the west side of our island somewhat warmer than that of the east, but cannot account for the known differences of temperature on the *same* coast. But we have now exhausted the causes usually assigned for such differences, and have evidently not yet obtained a satisfactory answer to our inquiry. We must therefore set out again in our investigation, our further progress being over a less beaten path.

The difference between the latent heat of water and that of vapour is 980° of Fahrenheit. That is to say—the heat required to convert any quantity of water into vapour would raise the same quantity of water 980 degrees higher in temperature if the water did not pass into vapour, or would render ten times as much water 98 degrees warmer. Consequently, vapour condensed into water gives out 980 degrees of caloric; and water in evaporating, absorbs caloric to the same number of degrees. This is a well-known fact, but one that has not been duly appreciated in its bearings on meteorology.* When it is duly weighed, there cannot be a doubt that its influence on local temperature must be very great, and quite sufficient to account for the inequalities we have as yet left unexplained.

If we take the mean temperature of Great Britain at about 49° of F., then every drop of vapour condensed in the atmosphere adds as much heat to the air in which the condensation takes place, as would be imparted by six

* Lest I should appear to put forward, as original, opinions which have been advanced by others, I may say, that in a communication to the Royal Society of Edinburgh, read at their meeting on the 5th February, 1849, I distinctly urged the important effect which the disengagement or absorption of latent heat would necessarily have on the temperature of the soil and atmosphere; and although the same theory has, *since that time*, been maintained by others, yet I was, so far as I am aware, the first to bring it forward.

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drops of boiling water giving out to it all their excess of heat. Every shower of rain that falls warms the air in which it is formed, as much as it would be warmed by six equal showers of boiling water poured into it. On the other hand, every drop of water evaporated from the soil, steals from it as much heat as would boil six drops of water.

Now, if all the rain that falls were again evaporated, the result would be a mere fluctuation of temperature; the air being alternately warmed by the formation of a shower, and cooled by its being again dried up from the soil. The average temperature would neither be raised nor lowered. But if the heaviness of the showers caused a great part of the rain to flow off the surface, or if the natural or artificial porousness of the soil drained off a great part without permitting it to evaporate, we should then have the temperature raised above that of another place not similarly circumstanced.

It thus appears that the mean temperature of any place may be affected materially *by the quantity of rain* that falls around it, especially to the windward; *by the heaviness of the showers*, and *by the porousness of the soil.* When we consider, therefore, to what an extent these three circumstances vary in different localities, we can scarcely doubt that we have at last obtained a sufficient cause of those local peculiarities of temperature which we have hitherto failed to account for.

The mean quantity of rain that falls yearly, varies in different parts of this island, from twenty to sixty inches* at least, leaving a difference of no less than forty inches.

* I have confined myself to well ascertained numbers, and these, exclusive of extreme amounts, limited to a few localities peculiarly situated. If the latter were taken into account, the difference would be much greater. It is said that the annual fall of rain in some spots of this island amounts to upwards of 120 inches, or even as much as 200.

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To compute, in exact numbers, the effect that this difference should produce on the atmosphere, is impracticable, depending, as it does, on the extent of the dry or rainy district, on the height at which the showers are formed, and on the velocity of the wind; but it is easy to perceive that the effect must be very great. This will be seen at once from what has previously been stated. A difference of forty inches in the fall of rain is equivalent in its direct effect upon the atmosphere of the rainier district, to pouring into that atmosphere, in the course of the year, as much boiling water as would cover the whole surface of the ground to the depth of twenty feet; or, *every day, to the depth of two-thirds of an inch.*

In some localities the rains are more sudden and heavy, and in others more constant and drizzling. When the soil is sandy, or otherwise very porous, the difference is not so material in as far as regards the effect on temperature. But when the soil does not readily absorb the rain, it is evident, even when the *average* amount of rain is equal, that in the one case most of the rain may run off the surface, and in the other nearly all of it may be evaporated. On this head (viz. — the comparative heaviness of the showers), our information regarding the difference in different localities is, and must be, less precise than in regard to the whole annual fall. But the desideratum is of little consequence, since the effect of any difference which may exist is dependent on the nature of the soil.

The soil is in some districts so firm as to be almost impervious to water; while in other districts it is so loose, that it is quite capable of filtering through it the largest amount that falls, unless, perhaps, when it falls in very sudden showers; so that the difference arising from the nature of the soil may be as great as that which arises from inequality in the amount of rain that falls.

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When we have not only a clayey undrained soil, but a level surface, the cooling effect is much increased, because then very little of the rain flows off, and it is nearly all left to be evaporated.

We have next to inquire into *the circumstances that determine* the quantity of rain, the suddenness with which it falls, and the draining or evaporating tendency of the soil.

In the first place, let us inquire why more rain falls in one district than in another.

There appear to be three distinct causes of rain. 1st. The meeting of currents of cold and warm air. 2nd. The passage of a current of warm air over a cold tract of country. And, 3rd. The ascent of any portion of the atmosphere to a higher elevation.*

Of these three causes, the first can have little or no relation to peculiar localities, except on a more extended area than the present investigation embraces. The second cause, however, may operate within a more limited extent; for there are doubtless tracts of land, more or less extensive, having their temperature below that of the surrounding country, owing to evaporation from the surface of the soil. When a warm wind blows over a cold surface, the moisture suspended in it is condensed either on the surface itself, or in the atmosphere above it, in the form of mist or rain. It has been remarked by practical observers, that the greatest quantity of rain usually falls upon the wettest tracts of land, and that the progress of draining, in some districts, has partially removed the fogs and drizzling rains previously frequent. In regard to heavier rains, the cause is probably, in most cases, mistaken for the effect; but there

* It has not as yet been proved, as far as I am aware, that electrical discharge is *a distinct and independent* cause of rain, and not rather itself the result of the first or second cause mentioned above.

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can be little doubt, that a tract of cold wet soil will produce fogs or even lighter rains. But whether rain or mist is the result, still in no case can any *warmth* possibly be added to the air by its passing over a cold region, whatever rain or fog may be produced by its doing so. *These* are occasioned by the *cooling* of the atmosphere, and it cannot be at once cooled and heated.

It is, therefore, to the third cause, and to that alone, that we must look for the production of any local effect in raising the temperature. It is well known, as I have said before, that air in ascending expands, and in expanding cools, every additional elevation of about 300 feet reducing its temperature one degree of Fahrenheit. It is also well known, that the quantity of water capable of existing in the form of vapour in a given space, is dependent on the temperature, along with the atmospheric pressure. Let any portion of air, saturated with moisture, ascend till it is relieved of half its pressure from the superincumbent atmosphere. In doing so, it would expand to twice its original bulk, provided there were no change of temperature. At the same time, the vapour suspended in it would also expand to twice its bulk, and would still be exactly sufficient to saturate the air. But since the temperature necessarily becomes much lower, the quantity of vapour capable of remaining suspended in a given space is very much diminished. At the same time, the bulk of the accompanying air is contracted slightly by the loss of heat. The vapour, therefore, is, from the cold, at once confined to a smaller space, and the quantity capable of existing as vapour in a given space diminished: consequently, for a twofold reason, a portion of it becomes condensed — at first in the form of mist, and afterwards in that of rain, when a further ascent has augmented the quantity condensed.

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The weight of water capable of existing as vapour in any given space, at the ordinary temperatures in this island, diminishes about 1-31st part for every decrease of one degree of temperature, descending nearly in a geometrical progression. At the same time, air has been proved to lose, at an average temperature, about 1-500th part of its volume for a decrease of one degree of temperature; but not, like the other, descending in a geometrical progression, but as nearly as possible in an arithmetical one: the difference for every degree being about ·00243, or 1-400th of the volume at 32° of Fahr. This last-mentioned loss is so small, that it may be neglected for one degree, and we may say, in round numbers, that at all ordinary temperatures, a given quantity of air saturated with moisture loses about 1-31st part of the vapour it contains for a loss of one degree of temperature — that is, for about 300 feet of perpendicular ascent; or, taking the change of volume of the air into account, and estimating the quantity of vapour in a given space as descending in a geometrical progression, as the thermometer descends *moist air loses one-half of all the vapour contained in it, by a loss of twenty degrees of temperature, corresponding to a rise of* 6000 *feet.**

An ascending current of air may be produced by the partial effect of the sun's rays shining on one spot and excluded from another. But this cause is less influential than we might suppose, since, whenever the sun's rays do not shine on the ground, they are not lost, but are intercepted by some cloud, to which they impart the

* It has been computed, by another mode of calculation (Ed. Encyclopædia, Hygrometry, 97), that the effect just mentioned is produced by a rise of 4500 feet. This difference results from the employment of different data, since it is assumed, in that computation, that the temperature varies one degree with a rise of 270 feet; while I have taken 300 feet as nearer the mean of the various experimental determinations. The results, as far as they depend on *computation*, do not materially differ.

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warmth that would otherwise have been bestowed on the ground, and communicated from it to the superincumbent air. And even if inequality of sunshine were decidedly a cause of ascending currents, that inequality is either accidental, varying every instant, and in favour of no particular spot; or if any one spot has habitually a clearer sky, the average temperature of the ground, as said before, is not thereby raised, since as much heat is lost by extra radiation during the night as is gained by the excess of sunshine during the day; and, consequently, descending currents must prevail as much as ascending currents. In fact, any ascent of a current of air caused by *heat*, cannot be a source of moisture deposited from that current, since such deposition is itself only the result of *cold*.

For the origin of rain from the ascent of any portion of the atmosphere, we must therefore look to another great cause of disturbance in the levels of the aerial strata, namely, the inequalities in the surface of the subjacent country. When a wind is directed towards a ridge of mountains, it must necessarily pass over the ridge, and in doing so, the stratum of atmosphere nearest the ground must be raised as much as the mountainous tract is elevated; and the whole of the atmosphere in motion, for a considerable height at least, must be raised as much, or even more, since in ascending it expands. Even when nothing more than a *single* mountain stands in the course of the wind, the current will much more readily pass over than round it, the angles of elevation of almost all mountains being inconsiderable. When we reflect, therefore, that many hills in Scotland are upwards of four thousand feet in height, and several in England and Wales upwards of three thousand, we shall see that there is ample room, on this ground alone for all the diversity in the amount of rain that experience actually shows, and

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consequently for a considerable variety of temperature. This will be still more apparent, if we take into account the following facts:—

At the average temperature of this island, viz., 49°, the weight of a cubic inch of air is ·315 of a grain, the barometer standing at thirty inches. Under the same barometric pressure, the weight of a cubic inch of vapour, whether in vacuo or in air, is ·00239 or about $\frac{1}{400}$ of a grain: and at the pressure named, the weight of a column of the atmosphere, of unlimited height, is equivalent to that of a column of water, on an equal base, of the height of 407 inches. Consequently, supposing the column of the atmosphere to be saturated with vapour, and to retain the temperature of 49° thoughout, the moisture contained in it would amount, if condensed, to a column of water, on the same base, full three inches in height.* Suppose, therefore, the whole atmosphere, saturated with moisture, to pass from the surface of the ocean over a height of 3000 feet, it will part, in its passage, with ·28 of all the moisture it contains—that is, at the average temperature, ·84 of an inch. This depth of rain will be deposited over the whole ascent every time that the atmosphere is renewed over that extent. If the summit of the ridge, for instance, is thirty miles from the sea, and the wind moving with a velocity of twenty miles per hour, then ·84 of an inch of rain is deposited over the whole intermediate tract in an hour and a-half. But this is a case that will seldom occur to its full extent: our most humid winds are usually those from the south-west, and these, on reaching most of the highest tracts of Great Britain, have already discharged a considerable portion of their moisture in passing over Ireland.

* The circumstance of the temperature being lower in the higher regions, and consequently on an average below 49°, is fully compensated by *the average deposit for all temperatures*, being considerably above what is due to *the average temperature*, since the vapour in solution increases in a geometrical progression, whilst the temperature ascends by equal differences.

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The condensation of the vapour will take place during the whole ascent of the air, and if the ascent is uniform, the condensation will proceed equally throughout the whole rise; but at the commencement of the ascent, it will appear merely as a fog — a little higher, as a drizzling rain — then heavy rain up to, and *beyond* the summit; for since the fog and the rain are carried forward by the wind at the same time that they are forming and falling, a part will be carried beyond the highest ground, and that which is formed high in the atmosphere may be carried a considerable way beyond it. If the ascent is very slow, the rain will be comparatively light: if the ascent is sudden, and at the same time of sufficient height, the rain may be very heavy.

If the wind, after descending from the first ridge, reach a second, it will deposit no moisture on the second ridge until it reach a greater height than the summit of the first. It is only at every successive elevation to a *greater* height than it has ever previously attained, that fog or rain appears. Beyond the highest ridge there is no rain from this cause. It is otherwise with the temperature: it is continually raised as more and more vapour is deposited in the ascent, but the warmth thus added to the air does not disappear where the rain terminates, but on the contrary continues undiminished everywhere to the leeward. The heat gained is retained in the current of air, until it again absorbs from the earth or ocean as much moisture as it had at first.

But it may be said, if the air is warmed by the deposition of moisture in passing over a mountain, how can it be at the same time cooled? and yet it must be cooled before it give out any moisture at all. What is really said is this: the air by its ascent alone, if no vapour were condensed, would be much cooled, and would continue so while it remained at the higher level; but the conden-

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sation of the vapour contained in it prevents it from being *so much* cooled as it would otherwise be; and it does more; for when the air again descends to a low elevation, it has a higher temperature than it had before it ascended. If the ascent cooled it, the descent warms it, and *that* not merely as much as the ascent cooled it, but as much as the ascent *would* have cooled it if there had been no condensation of vapour; so that the air, on returning to its original low level, not only regains its original temperature, but has added to it all the heat that was due to the condensation. Hence, if two places stand at the same elevation, the one having no high ground between it and the sea, and the other having a mountain interposed, when the wind blows from the sea, it may reach the former place both damp and cold, and the latter dry and warm. Hence also the same wind which blows over the windward side of a country, cold, cloudy, and rainy, breathes over the leeward side with genial warmth and a cloudless sky.

Such is the result of theory: let us observe how it agrees with *facts*. The tops of mountains, it is well known, are so often enveloped in clouds, that the former are commonly, though erroneously, supposed to *attract* the latter. The greatest quantity of rain is observed to fall in mountainous districts, while on extensive level tracts little rain falls. Probably the sole cause of the dryness of the Sahara itself, is its flatness and low elevation, surrounded, as it is, by high land on all sides. The eastern side of South America, within the tropics, being exposed to the trade wind, is constantly damp and cloudy, while *the same wind*, after it has passed over the Andes, is dry and sultry. In Hindostan, the eastern side of the country and the western have their rainy seasons in opposite periods of the year: when it is dry on the former side, it is the wet season on the latter, and *vice versâ;* and those

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seasons are determined by the course of the wind, the side exposed to the wind being always rainy and the opposite side dry.*

Having thus, as I think, established that *one* grand cause of the difference of local temperature is the difference in the amount of rain which falls to the windward, and that the cause of such difference in the quantity of rain is the greater or less increase of elevation in the ground over which the wind blows, we may now proceed to consider the other circumstances that modify temperature, arising from evaporation and condensation.

Of the *second* (pointed out on page 175), I shall say little further than repeating what I have asserted before, that when the falls of rain are sudden, more of the water will flow off the ground without penetrating the surface, and therefore less will be evaporated, and the average temperature of the ground where the rain falls, and consequently of the atmosphere to the leeward, will be higher than it would have been if the same quantity of rain had fallen in more gentle and constant showers.

I go on to the *third cause*, viz. — the difference in the nature of the soil over which the wind has passed. I have before shown, that the difference in the nature of the soil, *in respect to radiating power*, does *not* affect the mean temperature; but it is altogether different when we regard the soil *in reference to evaporation*. It is of course only on a somewhat extensive scale that this circumstance can produce any great effect on the atmosphere: the rain must pass over a considerable tract before it can be

* For *some* of the above illustrations, and much of the *data* and *principles* on which the preceding conclusions respecting the *origin of rain* are founded, I am indebted to the late Dr. Andersons' excellent articles on Hygrometry and Physical Geography in the Edinburgh Encyclopædia. For all that relates to *temperature*, I am alone responsible. See also Article 155, of Dr. Thomson's "Introduction to Meteorology," a work of great research, and abounding in interesting details in all departments of that science.

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much cooled or warmed by the ground: yet there can be little doubt, that in calm weather, a single mile of extent of a dry or a damp soil will produce an effect on the temperature of the atmosphere which passes over it, sufficient to affect a common thermometer, and much less than *that* will sensibly affect the feeling. The difference in the temperature of the *soil itself*, from this circumstance, is almost wholly independent of extent, since the smallest area of wet soil will show a temperature inferior to that of the surrounding dry soil.

That surface which evaporates most, will, of course, be most cooled. One kind of surface may turn off the greater part of the rain which falls upon it, without permitting it either to be absorbed by the soil or to remain upon it: another kind of surface may permit nearly the whole of the rain to penetrate it, leaving little to be evaporated. Each of these two kinds of surface produces little evaporation, and is, consequently, favourable to a high temperature. The former is exemplified in a soil of stiff clay, with a surface so regularly sloping, that no water is retained in pools, and with little or no covering of loose earth or vegetable matter which can absorb or retain water. The latter is seen in a soil of loose sand or gravel, sufficiently deep to drain off all the water which falls upon it, and also without any covering of a retentive nature. On the other hand, the surface most favourable to evaporation and least favourable to a high temperature, is a level soil, very retentive of water, with an impervious sub-soil. A gravelly or sandy soil, of sufficient depth, even over a retentive sub-soil, may be conducive towards a pleasant climate, drinking in the superfluous moisture of rainy weather, and permitting it to evaporate in summer, thus moderating the summer heat without adding materially to the cold of winter, although it will certainly considerably reduce the average temperature of the year.

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Of such a character are the large level tracts of gravelly soil which form the low lands of Surrey. The climate is warm and pleasant in winter, while the evaporation from the water, which is always to be found a few feet below the surface, moderates the heat of summer. On the other hand, a surface singularly conducive to the production of an unfavourable climate, is that of the flat undrained ground in the immediate vicinity of Liverpool. The soil is a stiff clay, almost wholly impervious to moisture. There is not sufficient declivity to make the water flow off the surface, and just enough of turfy grass to retain it. The consequence is, a constant evaporation in rainy weather, producing a cold, comfortless, unhealthy atmosphere at the very time when a little warmth would be so desirable, and leaving little moisture in the ground to moderate the heat of summer. The advantage of draining consists not merely in carying off the superfluous moisture, but in bringing the whole soil into that loose condition, which causes it to retain a large supply of moisture, in what we may call a latent state, until it is required. When a soil of stiff clay is drained, it actually contains more moisture than it did in its previous undrained condition.

A peat bog is a great reducer of temperature from the large proportion of water which it absorbs, and the facility with which it parts with it, a quality which is greatly increased by the dense covering of mossy plants with which it is usually overspread. Such a surface is singularly unfavourable to climate, owing to the great amount of moisture which it retains during rain, and the readiness with which it again parts with it to the atmosphere. I have found, from experiment, that moss absorbs five times its own weight of water, and when saturated, loses more than one-fourth of its moisture in twenty-four hours, by mere exposure to the air, without sunshine or any

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circumstance unusually favourable to evaporation. Peat, I have found, retains more than twice its own weight of water, while loose clay retains only its own weight, common earth about half its weight, and sand a little more than one-third. I have also ascertained by trial, that if 600 equal parts by weight be taken severally of peat, clay, earth, and sand, all saturated with water; then, in the same time, clay loses by evaporation 338 parts by weight, earth 285, sand only 262, and peat as much as 447 parts. Hence we may rest assured, that a large tract of peat bog to the windward of any place, must have a singularly unfavourable effect on its temperature, while a large tract of sandy or gravelly soil will have exactly the opposite effect. The contrast will become extreme in a district where much rain falls.

Matted grass, rushes, &c., have to a certain extent, the same effect as moss. *When moss covers a dry soil*, its cooling effect will be transient; but *when it covers a wet soil*, it must produce a permanently cooling effect in a powerful degree. Trees and bushes also, since their extensive surface of leaves promotes rapid evaporation, must have great influence in depriving the atmosphere of its warmth after or during rain.

Even water itself evaporates less than wet soil, whether covered with herbage or not. This may be proved, by putting moist earth into one pan of a balance and a counterpoise of water into the other, and then exposing them thus suspended to a current of air; the pan with the earth will soon begin to rise, and continue to do so until it is pretty well dried. If the earth is covered with growing grass, the evaporation will sometimes be much greater than from the bare earth, at other times less. If moss is put into the one pan and water into the other, the moss will rise very quickly and very powerfully. Many

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years ago, two morasses, in the higher part of Ayrshire, were converted into ponds, for reservoirs, covering perhaps 200 acres: it is maintained in the neighbourhood as an undoubted fact, that the night frosts, which were previously very hurtful to the potato crops, disappeared from the district, or at least were much abated after the construction of the ponds. This may have arisen from the evaporation being diminished, by the conversion of the swamps into ponds.

Hence it will appear, that artificial drainage, when carried out to any great extent, must have a peculiarly beneficial effect on the climate of a moist and cold district. It will not only *dry* the soil and air, but also increase their warmth. The more rainy the climate, the more capable it is of having its temperature raised by this means. On our hill pastures, the effects of draining are two-fold: it not only dries the soil, but also removes the covering of moss, rushes, and matted grass, which produce evaporation with such rapidity. Under the influence of draining, with other suitable accompaniments, the wild mountain tracts, occupying by far the greater part of Scotland, and also much of England, now covered to a great extent with cold unproductive swamps, and that frequently over the richest soil, will soon, we may hope, be seen not only richly clothed with the finer meadow grasses, but also enjoying a genial climate; while they will breathe upon the plains below an atmosphere of a very different kind from that which now descends, damp and cold, from their summits. But without going so far as the Scotch, the Welsh, or the Yorkshire mountains, let our charity begin at home. Were the Parliament Fields, and other wet tracts in the neighbourhood of Liverpool, to be subjected to complete drainage, the effect on the climate would be singularly beneficial. That cold, damp, and spirit-depressing

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atmosphere which we too often breathe, would be exchanged, to a certain extent, for one that would be dry, sunny, bracing, and healthful. And while I am on the subject of drainage, I may perhaps be permitted to add a few words on the drainage of Liverpool —not of the surrounding country, but of the town itself. It is a digression from the subject of temperature, but one of so much practical importance to us all, that I venture to touch upon it briefly. I am aware that my local knowledge is very limited, and if I err in any respect regarding facts, I shall be glad to be set right, but I intend to confine myself to what I have seen, and to that which, I think, any one may see daily.

I am not about to allude to the system of street drainage, which within these twenty years has been carried out, I should think, very efficiently, and greatly to the advantage of our health, in as far as it has been turned to account by the proprietors of houses, by making openings into it for their sewerage, an object, as yet, but partially attained, but that to which I mean to refer is the drainage of the ground itself within the town, and especially of the foundations of the houses. The impervious character of the stiff clay which covers so much of the site of the town, and of the contiguous ground over which it is rapidly spreading, renders attention to thorough drainage a point of the first importance if health is to be at all regarded. Instead of that, it is often left to nature and to chance. Of this we have daily observation, not only in the case of cottages but of large and expensive houses. We observe a piece of vacant ground, with which we have been long familiar, as standing for days or weeks together covered with pools of water. Some builder thinks he can make a good speculation by covering it with houses. The pools disappear for a few hours

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under the operation of digging the foundations, but after a few hours more, the water re-appears in increased quantity. We then expect to see the builder make a drain a little deeper than the foundations, to carry it all off, but no such thing. A few rows of open bricks are laid, the earth is again heaped in, and these, like charity, cover a multitude of faults. The house is soon plastered, painted, and occupied. The occupants mysteriously lose their health, the servants and the children take fevers, the doctor is sent for, but to no purpose, because his medicine cannot reach the *seat* of the malady, and one or more additions are made to the register of deaths, and an equal number of testimonies added to the unhealthiness of the town. Somtimes a layer of pitch or bitumen, in the case of a superior house, is laid above the foundation, affording a very imperfect preventative of the moisture's ascent in the walls, instead of the radical cure, by draining it all off. My belief is, that a system of thorough drainage for town and neighbourhood, is all that Liverpool requires, over a great part at least, to render it a healthy town.

NINTH ORDINARY MEETING,

ROYAL INSTITUTION, 21st February, 1859.

The REV. H. H. HIGGINS, M.A., Sen. V.P., in the Chair.

Mr. GLAZEBROOK's resignation was received and accepted.

Several nudibranchs from the Egremont shore were exhibited by C. COLLINGWOOD, M.B. The most interesting were the *Doris proxima*, first discovered here by Mr. Price, the *Eolis picta*, *E. despecta*, and *E. concinna*. The two last were met with on the fronds of *Laomedea gelatinosa*, in company with the *Doto coronata*.

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Mr. T. C. ARCHER exhibited a curious Chinese window, made with the translucent shell of the *Placuna*. Also plates of the *Victoria Regia*, at Kew.

Mr. MORTON exhibited a geological section of the locality of the submarine forest, near to the Leasowe embankment. The sand drift having been removed by the agency of winds and high tides, an unusually favourable opportunity had been obtained for making this investigation, the results of which were promised in a more extended form.

The paper for the evening was then read by Mr. WILLIAM KEITH — "ON THE PAST, PRESENT, AND FUTURE OF PHOTOGRAPHY."

In the conversation which followed the reading of this paper, attention was drawn by Mr. ELLIOT to the curious photographic power of nature upon the trout, which leads to the formation of effects upon its body and different colourings, through the action of light.

TENTH ORDINARY MEETING,

ROYAL INSTITUTION, 7th March, 1859.

THOMAS INMAN, Esq., M.D., President, in the Chair.

Mr. JOHN ROBERTS was elected an ordinary member.

Mr. HENRY DUCKWORTH described the *Troglodytes gorilla*, the largest known anthropoid ape.

Mr. MARRAT exhibited a blue heliotrope, the first which had come under his notice.

Dr. THOMSON detailed some observations made upon the habits of *actinæ*, and mentioned that a mesymbrianthemum had been imprisoned for nearly three days in the stomach of a troglodyte, and was ejected alive.

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The paper for the evening was then read:—

ON THE ASTRONOMY OF THE ANCIENT CHALDÆANS, REGARDED AS AN EXPONENT OF THE RECENTLY DISCOVERED MONUMENTS OF NINEVEH AND BABYLON.

By CUTHBERT COLLINGWOOD, M.A., M.B., F.L.S., &c., &c.

It is a task of no small difficulty to penetrate so far back into the mists of antiquity, as to arrive at that remote age when the study of astronomy first engaged the attention of mankind. The labours of many able and learned men have been directed to this subject, but considerable difference of opinion has resulted from their researches. And it could scarcely be otherwise, when the very sources of information on which we most naturally rely give such a diversity of accounts, that the modern historian usually singles out that theory which best accords with his own preconceived notions, and sets himself to prove its truth. The great work of M. Bailly is a model of speculative ingenuity. Instead of a gradual collection of facts, and the mere rudiments of science which we find scattered through the early history of all nations, this celebrated but unfortunate writer imagines that he sees the shattered remnants of a great and perfect system, which some lost nation had, ages before, built up; and that this system was the common origin of the Chaldæan, Eygptian, Hindoo, and Chinese Astronomy.* He says, referring to some happy speculations of ancient philosophy which were not established as *truths* till ages afterwards, "These bold and merely philosophical ideas were not supported by facts among the ancient nations known to us, though perhaps we may be able to show that they

* Bailly. "Traité de l'Astronomie Ancienne." Paris, 1781, pp. 16, 70, 80, &c.

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were the vestiges of a higher antiquity, and of a science brought to perfection." This theory, propounded with all the elegance and learning for which he was distinguished, found many disciples; and Professor Playfair* was led, by his review of the subject, to believe that the Hindoos must have possessed astronomical tables at a remote era, which implied the existence of very extensive and accurate scientific observations. But the Utopian theory of the French academician finds but few supporters at the present time, though his learned and laborious collection of facts is appreciated by all. Bishop Berkeley, while admitting that there were traces of profound thought in the various schemes of ancient philosophy, refers the explanation of it to the fact, that "men in those early days, were not overlaid with languages and literature. Their minds seem to have been more exercised and less burdened than in later ages, and as so much nearer the beginning of the world, to have had the advantage of patriarchal lights handed down through a few hands."†

Astronomy has been called the Universal Science, and its laws are the Laws of the Universe — it is the science by which, above all, Man has vindicated the nobility of his intellect, and established, as it were, a nearer communion with the Divine Mind. When we consider our position in the system of the universe, the minuteness of the speck of vantage-ground from which the observations of the astronomer are to be made, and the constant movement of that speck amidst bodies, all of them in motion, the marvellous powers of analysis become more evident — for with the mechanical assistance of the space-penetrating telescope, and the equally important aid of infallible numbers, the astronomer is enabled to

* Playfair. "On the Astronomy of the Brahmins." Trans. R. S. Ed., vol. ii. 1790.
† Bishop Berkeley, "Siris," p. 141.

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sweep the utmost bounds of the universe — to analyze the movements of the heavenly bodies — to distinguish the causes and the amount of their perturbations—and thus, by connecting the scattered links in the chain of causation, to arrive at length at glimpses, and even at well-defined views, of the architecture of the heavens. The boundless distance of the bodies under observation, their enormous magnitude, and their inconceivable velocity, are all admitted as elements of the sublime in the human mind, while the numbers which enter into astronomical calculations are of such immeasurable vastness, that they overwhelm the imagination, and only permit of a relative judgment of their immensity. But while we look with wonder and admiration at the fabric which has been raised, and at the knowledge of the expression of universal LAW which has been arrived at, we must remember on the one hand, that many phenomena still baffle us, as for example the nature of comets — the forces which act in the spiral nebulæ of Lord Rosse — the significance of variable stars, &c.; and on the other hand, we must bear in mind, that although an error in angular measurement, five hundred times as great as that which would now employ the correcting pen of our observers, would have been passed over by Ptolemy—nevertheless, it ill becomes the modern astronomer to hold in contempt the apparently absurd theories and speculations of the ancients; for, as M. Bailly justly remarks, all depends upon circumstances and means — *we* have the accumulated experience of ages, and it has taken two thousand years to arrive by the mazy paths of error at the clear and burning light which now shines in the sanctuary of truth. Nor need any despair of arriving at yet higher truths, and more perfect generalizations in this or in any other science; the limits of the human intellect are not yet reached; and let it be

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remembered, that although Adam Smith pronounced the knowledge of the weight and density of matter in the sun, planets, and satellites, to be a result almost beyond the reach of human reason and experience, yet how soon was this estimate falsified by the sagacious inductions of Bailly, Brindley, Airy, and other astronomers, based upon their mutual perturbations and disturbances.

Several nations have either claimed for themselves, or have had claimed for them by others, the honour of having been the originators of astronomical science. Chaldæa, Egypt, India, China, and Greece, are the chief upon the list, and arguments more or less cogent have been adduced by the supporters of each; but while endeavouring to indicate that it is to the first of these ancient nations that the honour is due, I will give some brief reasons for excluding the others from the list of candidates. Even in Greece there can be no doubt that the study of Astronomy is of high antiquity, although they borrowed the earliest beginnings of it from other nations. Only very rude observations existed in Greece up to the time of Pythagoras (B. C. 557), and it would appear that the earlier Greeks, those therefore who were the most competent judges, disclaimed any pretensions to having originated astronomy; for Herodotus states (Euterpe c. 4), that in his time (B. C. 450), the Egyptians were more skilful astronomers than the Greeks; and further, he allows (c. 43), that they borrowed the twelve gods (which were of astronomical origin) from Egypt. Solon, the great Athenian lawgiver, reported that "his own countrymen were mere novices in the sciences of antiquity," while (in the Epinomis), Plato makes the Athenian say;—"I cannot tell you the name of the third star, for it is not known. The reason of this is, that the first who made these discoveries was a Barbarian. For it was an ancient country which produced

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the first who cultivated this study, where they were favoured by the beauty of the summer season, such as is Egypt or Syria * * *. These observations, verified during an almost infinite series of years, have been spread abroad in all places, and particularly in Greece."* Yet notwithstanding this withdrawal of claim made by the most ancient historian, legislator, and philosopher of Greece, there have been men in modern times (including Sir Isaac Newton), who have laboured to attribute to them that to which they themselves denied their right. Thus, Costard, in his learned work,† expresses his main design to be "to restore to the Greeks the honour of inventing what the world generally supposes them only to have borrowed." But there is much internal evidence opposed to this imagined priority of the Greeks, which will appear as we advance; and the Oxford divine is sometimes led into contradictory statements in his ardour to follow out his *main design*.

With regard to India and China, there can be no doubt that their observations reach a very high antiquity. It hardly comes within the scope of my subject to do more than indicate the fact, as the evidence against their priority is rather negative than otherwise. There is recorded, in the "Tung Kien Kang Muh," a very ancient Chinese observation of the conjunction of the five planets in the beginning of spring, during the reign of Chuen Hio; and according to Lindsay,‡ "the ancient documents of China abide the test of the severest scrutiny, and we are fully warranted in receiving them as genuine." Kirch assigns the date of B.C. 2448 for this conjunction. This, according to the received chronology, would be before the flood, and therefore could hardly be an ob-

* Compare Cic. de Div. I. i.

† Costard, on the "Rise of Astronomy among the Ancients."

‡ J. B. Lindsay. "The Chrono-Astrolabe," p. 100.

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servation specially Chinese. Moreover, Greswell is very distinct on this point, and asserts, that "whatsoever Egyptians, or Chinese, or Hindoos, or any other nation, ancient or modern, may pretend to produce to the contrary, B.C. 1520 (the date of Hezekiah's sickness) is much more remote from the present time than the beginning of authentic history anywhere out of the Bible. It may be asserted with confidence, that not a single event of this year, either is, or can be known at present, except from Holy Writ."* A work of Confucius, however (Chun-tsiu, B.C. 550), is extant, containing authentic accounts of thirty-six solar eclipses, all of which are said to have been verified except four, extending backwards to B.C. 719,† proving their observations to have advanced to a great degree of perfection at a very early period. The first eclipse related in the Almageste is one of the moon, B.C. 721, observed at Babylon (Book iv. p. 95).

The Hindoos doubtless had relations with China very long before the Greeks and Romans; and Dr. Vincent remarks, in his edition of the Periplus of Nearchus, that 1700 years B.C. we find an account of the Ishmaelites conducting a caravan of camels, loaded with the spices of India, and the balsam and myrrh of Hadramaut, proceeding through Arabia to Egypt, for a market (Gen. xxxvii.): showing at what an early period communication was kept up between these three great seats of astronomic and other science; and to which commerce, probably Thebes and Memphis owed their splendour and prosperity. Like most other of the oriental nations, the Indians laid claim to an extravagant antiquity; and Satyavarta, the first of the Solar race of princes among the Hindoos, is fabled to have reigned the whole of a Satyazug, or 1,728,000 years.‡

* Greswell. "Fasti Temporis Catholici," vol. i. p. 322.

† Lindsay. "Chrono-Astrolabe," p. 94. ‡ See page 201.

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But the controversy concerning the antiquity of astronomy lies really within narrower limits, and the claims of Egypt and Chaldæa are paramount above all others; it is between these two nations that the question is undoubtedly contracted. In Egypt especially, the priests pretended to a vast antiquity, and invented many stories, some of which are detailed by Herodotus (Euterpe, c. 142), concerning the myriads of years that their country had existed. Thus they feigned that they had a king who reigned three myraids of years; although this is a comparatively short period to the reign of the Indian Satyavarta. The Egyptian chronology of Herodotus carried them back nearly 50,000 years — a duration which may be considered as purely absurd; and if taken literally, no doubt it becomes so, and yet there have been found modern scholars who have been willing to allow them a considerable portion of this antiquity. When the celebrated zodiac was discovered in the ceiling of the temple at Denderah, the planisphere and square of which are now deposited in the Imperial Library at Paris, the French scholars unhesitatingly allowed it an age of 16,000 years at least,* notwithstanding that Herodotus, who so carefully observed, and so accurately described the cities of the Nile, fails to make any mention of this, the most magnificent temple of them all, thus confirming the opinion of the sagacious Belzoni,† that it was a Greco-Egyptian temple of the period of the first Ptolemy (Lagus), *i.e.*, built about 260 B.C., and 150 years after the historian's death. One effect of this boast of antiquity was perhaps intended, viz.—to let the Greeks see how much more venerable the Egyptians were than they, and how much superior to them in the arts and

* Dupuis must be excepted, who, in his "Dissertation sur le Zodiaque de Dendra," p. 28, assigns it a date of B.C. 1468.

† "Researches and Observations in Egypt and Nubia," p. 33.

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sciences; and indeed, the Greeks were much indebted to the Egyptians, for it is probable that Pythagoras drew most of his philosophy, which exercised such an extensive influence on Greek history and character from Egypt, which country he undoubtedly visited in the reign of Amasis, and if Iamblichus may be credited, remained there twenty-two years, when he was taken captive by the victorious Cambyses, and carried to Babylon. But on this subject, perhaps, Simplicius is more near the truth, who writing in the reign of Justinian, in the sixth century, says, "I have heard that the Egyptians have observations of the stars written down for no less than 2000 years, and *the Babylonians for more.*

In confirmation of the latter part of this sentence, we may quote Herodotus (Euterpe, c. 109), who tells us that the πόλος (or concave hemispherical sundial) and the gnomon, as well as the division of the day into twelve parts, were derived by the Egyptians from the Babylonians, clearly indicating that the latter were the masters of the former in astronomical science. Moreover, Greswell, in his most learned and valuable Fasti,* says — "It is a singular fact, that superior as the Egyptians were to the Chaldæans in the true science of astronomy, yet, in this particular science of astrology, they seem to have voluntarily acknowledged themselves their inferiors, and to have voluntarily submitted to be taught by them." Now we shall see as we proceed, that the earliest advances in astronomy were identified with astrology, and the two sciences were one, until mankind had gained such a mastery over the *true* science, as to be capable of pursuing it independently of the *false* one.† Although, therefore,

* Greswell's "Fasti Temporis Catholici," vol. ii. p. 74.

† In the best Latin writers, *astrologia* is employed to denote astronomy in general. (See Cic. de Divin. ii. 42). And astrology was traditionally, in Greece and Rome, of Chaldæan origin. Hence such expressions as "Ars Chaldæorum" — Χαλδαιων μεθοδοι — are of constant occurrence.

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the most ancient sphere was the production of Egyptian ingenuity* ((just as the first maps on record were those affirmed by Eustathius to have been charts of the marches of Sesostris); nevertheless, we must look to the plains of Shinar for the cradle of astronomical science, and to the dispersion of mankind, twenty-two centuries B.C. for its epoch. It is very evident from Genesis x. 10, that the ancient writer of that book looked upon the land of Shinar, the site of Babylon, as the post-diluvial centre of the human race. According to Bryant's mythology, the Chasdim, or Chaldæans, were descended from Cush, the son of Ham, and father of Nimrod, who lived B.C. 2240. The chronology of the cunieform inscriptions harmonizes perfectly with the numbers given in the scheme of Berosus, which scheme, divested of its fabulous element, gives a fixed date of B.C. 2234, for the commencement of the Chaldæan empire, a date which is corroborated by Simplicius, Pliny, and other authorities,† and endorsed by the researches of Sir H. Rawlinson. The Chaldæans themselves, however, like other nations, were not behindhand in claiming a fabulous antiquity. Cicero‡ says, that the Babylonians pretended to have observations extending over 470,000 years; and Berosus states, that the first ten kings of Chaldæa reigned 120 sari, the sarus being 3600 years. Thus the ten kings reigned 432,000 years, a period which, while it bears a close resemblance to that named by Cicero, is also of just the same extent as the Indian mythic period, called a Kali-zug.

In fact it is an undoubtedly astronomic period, and depends upon the Chaldaic divisions of Sosses, Neres, and Sares, as applied to decatemories. The decatemory was an astrological division of the zodiac into tenths of signs,

* Greswell's "Fasti Temporis Catholici," vol. ii. p. 71.

† Rawlinson's Herodotus, vol. i. p. 433. "On the Early History of Babylonia." By Sir H. Rawlinson.

‡ Cicero de Divin. ac Fato, lib. i. c. 19.

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each therefore consisting of 3°; and the Sosses, Neres, and Sares, were periods of 60, 600, and 3600 years respectively. Each decatemory being divided into 60 minutes, and each minute into 60 seconds, the assumed degree or decatemory, of which 120 complete the zodiac, will contain 3600 seconds, as the Sare contains 3600 years; and 3600 + 120 = 432,000 seconds, or minute fractional sub-divisions, as 120 Sari of 3600 years each compose the grand Chaldaic *period of restitution* of 432,000 years. This term, then, evidently refers to the great secular cycle of precession.* It is not a little remarkable, moreover, that while the Chaldaic *period of restitution* agrees with the Kali-zug of India, the Satyazug (referred to at page 197) is the same number quadrupled (432,000 × 4 = 1,728,000), clearly demonstrating the relation existing between these ancient periods and their common origin from precessional changes in the zodiac.

It does not come within the plan of the present paper to enter more fully into the proofs that Chaldæa was the cradle of astronomical science; but besides the evidence already adduced, it may be mentioned, that Artapanus† relates a tradition, that Abraham (who came out of Ur of the Chaldees),‡ instructed the Egyptian king in science; while Lucian, Plato, Cicero, and others among the ancients, and among the moderns, Sir William Jones, Montucla, and Landseer, have accumulated arguments in favour of its Chaldæan origin.§

Let us now examine the circumstances of its earliest development; and in doing so, we shall find, in addition,

* Religions of Profane Antiquity, p. 206.

† Artapanus, in Euseb. Prep. Evang., θ′; also Alexander Polyhistor, in eodem opere.

‡ Gen. xi. 31. Josephus (Antiq. I. vii. 2), quoting Berosus, calls Abraham *'ουρανια 'εμπειρος*.

§ "Les Chaldéens," says Bailly, "malgré les erreurs qu'on peut leur imputer, doivent être regardés comme le plus savant des peuples connus dans l'antiquité."—"Astronomie Ancienne," p. 152.

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internal evidence to the same effect. "It seems not to be doubted," says an old writer, "that there has been some kind of observation of bodies celestial since there were men." And there were two conditions which especially merit attention and consideration in this place, viz. — the beautiful climate of the country bordering on the Persian Gulf, and the occupation of its earliest inhabitants. Among the ancients, we have the testimony of Herodotus (Clio. c. 193) to the singular fertility, and abundant cereal riches of Babylon; and even at a more early period, it, or rather perhaps the country bordering it upon the north, had been alluded to in glowing terms by Rab-shakeh (2 Kings, xviii. 32). I have already referred to the remark of Plato; and every modern traveller is agreed as to the fertility of the soil, and the singular purity of the atmosphere of those regions. Layard* speaks of the country between Nimroud and Khorsabad, as "a rich plain, capable of a very high cultivation, though wanting in water" — which was anciently supplied by a extensive artificial irrigation, for which there are great facilities. Many other authorities might be cited, but these are sufficient to show that this is precisely the spot which would attract a pastoral people, who could settle here, and rapidly advance in arts, science, and civilization; while the clear atmosphere would not only give them facilities for astronomical observations, but invite them to such studies by the brilliant appearance of their nocturnal skies — "en sorte que le spectacle des astres les devoit occuper, pour ainsi dire, *malgré eux*."†

If we next glance at the occupation of this infant period of society, we shall have further cause to perceive by what means they were led to the prosecution of such observations. In the history of the progress of civilization

* Layard's "Nineveh and Babylon" (first journey, p. 130).

† Lalande's "Astronomie." Paris, 1764. Tome i. p. 63.

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of all nations, it is a general principle, that men in the rudest state of society obtained a subsistence from the chase, limiting their desires to bare existence and sufficiency of food. In such a savage state, we cannot expect to find any advance in art, beyond an improvement in the construction of weapons; such a community would not be sufficiently affected by any external circumstances, to make it worth the effort to reason how far they might succeed in making external circumstances subservient to their comfort, but subsistence once procured, the stimulus for labour, either of mind or body, is withdrawn. In the progress of social improvement, the condition of shepherds followed that of hunters. This change in the mode of living appears quite natural, inasmuch as men would be anxious to reduce into possession all the tamer animals rather than continue the precarious plan of hunting. The life of shepherds was peculiarly adapted to contemplation, and as the preservation of their flocks formed the chief object of their care, it was their interest to study the aspect of the nocturnal skies.* Under such favourable conditions, and with such a transparent atmosphere, they could not be long without observing, like the Saxon peasant Palitzch, and our own Ferguson, in a manner at first rude, that the heavenly bodies had certain proper motions, which they soon learned to associate with important terrestrial changes. The glorious sun arose, crossed the vault of the sky, then set, and was succeeded by the beautiful moon, and by all the host of heaven, which seemed to chase each other over the wide expanse, then fall into that mysterious western depth, simultaneously with the appearance of others in the east.† Moreover, the sun was not invariable in his blazing path —

* Duncan. "The Religions of Profane Antiquity," p. 5.

† Compare Hesiod "Works and Days," ii. 319; —

"When strong Orion chases to the deep
The Virgin Stars."—*Cooke.*

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he arose not always from the same point of the horizon, he culminated not always equally high in the heavens — his course was now contracted, now expanded, and these contractions and expansions were associated with seasonal changes of the utmost importance to their pastoral mode of life. The host of stars too, gradually traversed the vault of heaven, and the nightly appearance of the firmaments was an index of the solar power by day. Thus the sun's path through the stars, like a fiery serpent* coiling round the universe, was one of the earliest observations made. Then again the changing moon must have attracted the highest interest from these ancient "star-gazers and monthly prognosticators,"†—her waxing and waning orb — her seasonal absence and her regular reappearance. Next, the appearance of certain wanderers, threading their mazy path through the labyrinth of the fixed, could not but fail to be a matter of most curious observation. Thus it would be easy to trace the steps by which the sublime science rose into importance. But when, in a natural succession, these shepherds‡ paid more attention to the occupancy of the soil, to the division of land, to the sowing and planting it for the production of food for themselves and their beasts, they would be led into a far more minute observation of those phenomena which had previously been objects principally of curiosity and awe. They would then perceive, that the times of sowing and the times of reaping were, in spite of themselves, regulated by the movements of the heavenly bodies — that they depended on them, as it were, for the welfare of their crops, and ultimately for the

* Job, xxvi. 13.

† Isaiah, lxvii. 13.

‡ It will be recollected, that according to the priest Manethos, Egypt was conquered B.C. 2082, by a race of *shepherd-kings* (Ὑκσως) who came from the east, and retained possession of the country for 511 years.—(Josephus, c. Ap. i. 14, quoting Man. Ægypt. *lib* 2.)

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well-being of the community, and thus they would be led to reverence the starry host as divinities, and to worship them as Gods. Hence arose Sabæism or Astro-theology, which took its rise from the shepherd-race, and superseded natural Fetichism, or the worship or material substances as such. The pursuit of agriculture was most favourable to the development of Sabæism, and we find that the most ancient profane work which has come down to us* is a manual of Agriculture whose title interpreted by the scholiast, is, the art of agriculture and the proper season for its prosecution. And long did this pursuit exist as an honourable calling; "the ancients," says Niebuhr† "with one mind, esteemed agriculture to be the proper business of the freeman as well as the school of the soldier."

It is to these first steps in the history of astronomy—to the doctrines of the very ancient Sabæans, that we must look for an explanation of the old theogonies and mythologies, overlaid as they are with symbols. It is to a study of the stellar universe as it presented itself four thousand years years ago, that we must refer for a key to the religious fables of antiquity, apparently so utterly absurd and meaningless; and which are too often taught to the youth in our schools, without reference to their true import, or indeed without letting him be aware that they have, concealed under their harlequin exterior, the sublimest astronomical truths—the accumulated discoveries of the ancient observers. The enlightened antiquary of modern times, has done much to exonerate the ancients from those charges of frivolity and folly, which ignorance has sometimes shown an inclination to cast upon them.‡ By a comparison of the fragments of ancient

* Hesiod, Ἔργα καὶ Ἡμέραι.

† Niebuhr. "History of Rome," vol. i. Preface.

‡ Bacon's "Wisdom of the Ancients," passim.

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art which time has permitted to come down to our own day, with the scattered allusions to the framework of the ancient religions which are to be found in the works of their historians, philosophers, but especially in their poets, it becomes a matter of moral certainty, that those tales which, in wild extravagance, rival the boldest fictions of the "Arabian Nights," were, in fact, verbal expressions of the fundamental truths of astronomy—the motions of the celestial bodies, especially of the sun and moon, the great sources of light and life—of their risings and settings, their oppositions and conjunctions with the principal stars and with the signs of the zodiac. These were known to the priesthood (who, indeed, were the astronomers, and priests in virtue of their superior acquaintance with the heavenly bodies, their divinities) in all the sublimity of truth; but as they regarded the stars as superior Intelligences, it was considered profane to disclose them indiscriminately to the vulgar. While, therefore, they themselves carefully observed and noted the results of their observations, they shrouded the glorious truths in fantastic fictions and romantic tales, and *these* they gave to the vulgar to be their faith. Only to a favoured few were these mysteries unveiled, and truth discovered in all her moral grandeur. On these, the initiated, the most solemn oaths were imposed, that they should not divulge the secrets which were thus confided to them; for well the priests knew, that should the common herd know as much of the Majesty of Nature as they did, they would no longer be required as mediators, and thus their power and authority would at once terminate. And seldom, if ever, were these binding oaths broken. The least attempt, or appearance of an attempt (as in the case of Æschylus), was followed by instant vengeance. And this fully accounts for the few direct allusions to the nature of these mysteries which

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are found in ancient writers. They either avoid the subject altogether with a superstitious awe, or they hint at it so obscurely, that little information can be gathered from them. Indeed it is probable, that but few of them were acquainted with the origin of the Chaldean mysteries —for in passing from one country to another, from Arabia to Egypt, from Egypt to Greece, and from Greece to Rome, they were so garbled and decorated by the art of the poet, as to render them almost unintelligible to the latter people, and there were but few, if any among them, who could enter into the spirit of the founders of their religion.* Even the Father of History himself, while he is detailing fragments of information concerning the gods which he had gathered from the Egyptian priests, seldom appears to perceive their true bearing upon his religious system. These scraps, however, are of incalculable value to the intelligent student of antiquity. Had the promised work of Herodotus on Assyria (Clio. c. 184, &c.) come down to us, doubtless the conscientious, laborious, and discriminating collection of facts which distinguished him would have tended greatly to confirm many speculations which are yet needing the corroboration which the decypherment of the cuneiform inscriptions may still be anticipated to afford — but most probably that valuable scroll added fuel to the lamentable conflagration of the Alexandrian library, a catastrophe which the latest posterity will never cease to deplore.

But while the most ancient astronomers readily perceived that changing position of the stars which fulfilled its cycle in a single revolution of the earth, while they easily recognised the fact that the heliacal rising of a star took place on a certain day in each successive year —

* Strabo, who probably flourished in the half century before Christ, and was well acquainted with Egyptian affairs, says (lib. xvii.), that in his time the Egyptians were wholly ignorant of their ancient learning and religion, though impostors continually pretended to explain it.

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they could not so readily appreciate a subtle and minute change which all the while was displacing their indices, confounding those data which they at first regarded as invariable and infallible, and producing effects which, when they at length forced themselves upon their observation, must have struck them with dismay. This change was so slow and insidious, that it must have been long before it was recognized, and still longer before its cause was understood. The astronomer will know that I refer to the phenomenon known as the Precession of the Equinoxes — a phenomenon said to have been discovered by Hipparchus (the patriarch of astronomy, as Bailly calls him) about 128 B.C., but which I shall presently give reason to believe had been noticed long before his time. It is to a consideration of this phenomenon that we must look for the key to the fables of antiquity. That secular change which works so gradually, that many centuries probably elapsed before the ancient astronomers could bring themselves to believe in its existence, has, during the lapse of 4000 years, which have passed away since the commencement of the period of which we are writing, accumulated to such an amount, that we recognise with difficulty, in the *present* aspect of the heavens, the clue to that Sabæan theology which I imagine to be at the foundation of all the symbolical art and mythology of later times.

It is essential, therefore, that this phenomenon of Precession be fully understood, and it will not be out of place here briefly to allude to its action. Precession is one of the most remarkable of the secular inequalities — and by this term is understood, inequalities whose effects extend over very long periods of time before they come round to the condition from which they set out. The *tropical* year, or true year of the seasons, viz. — the period which elapses from the moment of the sun's path

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cutting the equator in spring, until it again intersects it in the succeeding spring, is 365 days, 5 hours, 48 minutes, 49·7 seconds; but the *sidereal* year, or that space of time which elapses between his leaving any fixed star, and again arriving at that fixed star, is shorter than the year of the seasons by 20 minutes, 19·6 seconds. This arises from the oblique and unequal attraction of the sun and moon upon the terrestial spheroid, giving it a motion about its centre of gravity, and forcing the plane of the equator to move from East to West. Now the sun, advancing among the stars at the rate of 59 minutes, 8 seconds of a degree in 24 hours, would, in 20 minutes, 19·6 seconds, have moved through the space of 50 seconds of a degree. It therefore cuts the equator every successive year 50·1 seconds short of the spot where it intersected it the preceding year — or in other words, the equinoctial points recede annually 50·1 seconds.* This space is small, it is true, when taken alone, but when it is borne in mind, that from all time this minute quantity has been annually accumulating, it will easily be understood, that since Astronomy was first cultivated, it has risen to a very considerable amount. Indeed, the whole circle being divided into 360°, and the precession being 50″ annually, it is easy to calculate that in seventy-two years the equinoctial points would retrograde through an entire degree — in 2160 years through a whole sign — and in a period of 25,867 years, they would perform a complete revolution, passing in turns through each of the

* I am aware that the *mean precession*, that is, the precession when deducted from that compensating tendency which arises from the action of the planets on one another and on the sun, is subject to minute periodic variations from the direct action of the sun and moon respectively upon the equator; but these are so small, that for all practical purposes they do not interfere with the main fact I am intending to convey; and indeed, a secular variation to which it is subject, has the effect of *increasing* precession, so that the tropical year is 4·2 seconds shorter than it was two thousand years ago.

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signs of the Zodiac, until at the end of that period they would arrive again at that sign from whence they set out.*

We are accustomed to speak of the Sun as entering the Zodiacal sign of Aries at the vernal equinox, and for centuries the Ram has been the leading sign in astronomical as well as in ordinary parlance; but although our celestial globes make the vernal equinox coincident with the first point of Aries, it is only a conventional arrangement, the character or sign only of the constellation being placed at that point, the star which formerly occupied that station being upwards of 30° from it. For in reality, the sign of Aries has been altogether displaced by the precession of the equinoxes, and the next sign, Pisces, has been substituted for it. In the present year the vernal equinox is sidereally coincident with the second degree of Pisces. It follows however as a result of precession, that 2160 years previous to the entrance of the Sun into Pisces (viz. — B.C. 388), the first point of Aries *was* coincident with the vernal equinox; and it equally follows, that for 2160 years anterior to that epoch, the equinoctial point had been gradually retrograding throughout the whole of the Zodiacal constellation Taurus. The first entrance therefore of the Sun into that sign must have taken place A.M. 1456, and B.C. 2548.

The dispersion of the post-diluvian race upon the plains of Shinar took place B.C. 2247† — 101 years after the flood; and the astronomical observations began at Babylon, according to Callisthenes, B.C. 2234, at which period the vernal equinox must have been coincident with the 5th degree of Taurus; or in other words, the sun rose cosmically with the head of Taurus at the vernal

* This is the grand Chaldaic *period of restitution* referred to and explained, in connection with the Indian Kali-zug, at page 201.

† See the Chronological tables in Barker's Supp.

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equinox; it was literally the period referred to by Virgil long afterwards; —

> "Candidus auratis aperit quum cornibus annum
> Taurus." *

Or as Dryden has rendered it —

> "When with his horns the Bull unbarred the year."

We have now arrived at a view of the condition of the sideral heavens at this remote period — and while it will be at once recognized as offering peculiarities which those who regard the heavens as unchanging, either in their real or apparent aspect, will view with surprise — it will also become evident that a full appreciation of these remarkable antecedents is necessary before we can duly estimate their influence on the minds of the earliest astronomers, or enter into the spirit of the founders of the ancient religious systems.

It does not appear that the Chaldæans produced any celestial sphere previous to that which originated with the Egyptians. That extraordinary people made rapid advances in scientific astronomy, outstripping their teachers, the Chaldæans, who devoted the principal portion of their attention to the elaboration of astrological theories. "Testimony" says Greswell † "is unanimous, that the sphere of the Egyptians, the first and oldest delineation of the sphere, was graduated from Aries;" and yet Taurus was the traditional first sign. If further proof were wanting, that the phenomena of precession were known to the Eygptians, it is to be found in the fact, that they had two kinds of sphere — an ecliptic or sidereal, and a tropical one — and the first degree of the tropical sphere was laid down on the 15th degree of the sphere of Mazzaroth,‡ thus telling a tale of a thousand years anterior observation or information.

* Georgics i. 218. † Greswell's "Fasti," vol. ii. p. 71. ‡ *Ibid*, p. 74.

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In the erudite "Inquiry into the Symbolical Language of Ancient Art and Mythology" of Mr. Payne Knight, he has collected from various authorities very remarkable proofs of the universality of the Taurine symbol, and I have the more satisfaction in quoting so great an authority, because he does not appear to have perceived its immediate bearing upon the question before us, or at all events he does not allude to it in that work.* He tells us (Sect. 31), that in addition to the Bull being, under the titles of Mnevis and Apis, one of the most distinguished of the sacred animals of the Egyptians, the Arabians appear to have worshipped their God under the same image. The Chinese have still a temple called the Palace of the Horned Bull, and the same symbol is worshipped all over Hindostan and in Japan. In the latter island — at Meaco — the organization of matter is represented by a bull breaking a colossal egg with its horns; and such a colossal egg exists in the Island of Cyprus, near Lemissa, with a bull sculptured upon it.† The Cimbri, in the extreme West, carried a brazen bull with them as the image of their God when they overran Spain and Gaul‡ — the name of the God Thor, the Jupiter of the ancient Scandinavians — signifies in their language, a bull, as it does also in the Chaldee; while according to Plutarch, it was the Phœnician for cow. He was represented, moreover, in the ancient temple at Upsal, with the head of a bull upon his breast, according to Rudbeck. Further, it may be added, that according to Bentley, Siva — the greatest of all the Hindoo Gods — was always

* In another work, however, printed more than thirty years earlier, to which this reference will be sufficient for the learned, he has shown a thorough appreciation of the subject.

† See Frontispiece to Landseer's "Sabæan Researches."

‡ Plut. de Mario; while Cæsar (de Bell. Gall. lib. vi. c. 21) says they worshipped the Sun.

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accompanied by a bull. Seeing then the very widely extended adoration which the bull received under various forms, we cannot help looking for some common origin to which we may refer these similar forms of worship, and the Zodiacal bull at once presents itself to our attention.

In the earliest ages of astronomy, the true relations and bearings of the heavenly bodies were by no means apprehended by their ancient observers. The regularity of their movements could not fail to strike with wonder and awe those who paid special attention to them, and the apparent sequence of cause and effect as applied to those movements, cannot fail to have exercised a powerful influence upon minds in which the religious sentiment is naturally implanted. Hence the Sabæans early established certain mutual risings of the Sun and fixed stars as unerring signs of the forthcoming seasons; and mistaking coincidence for causation, they fell into the not unnatural error of transferring the veneration due to causes, and which they would have paid to the *cause*, had they been able to recognize it, to the *signs* of those causes. Hence their astronomy was their religion, viz. — Sabæism or Astro-theology, and their astronomers were the priests — for regarding the heavenly bodies as the efficient causes of good and evil, they reverenced them as divinities.* Now, tradition and history both point to the fact, that the coincidence of the heliacal rising of Taurus with the vernal equinox was a very ancient discovery, and among the earliest of the astronomical data. But the vernal equinox was just that period, which to an agricultural people was the most significant and most important; for then it was, that nature started into new life after the

* *Φαινονται μοι δι πρωτοι των ανθρωπων * * * * τους μονους Θεους ηγεισθαι, δυσπερ νυν πολλοι των βαρβαρων, ἡλιον, και σεληνην, και γην, και αστρα, και ουρανον.—Plato in Cratylum.*

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sleep of winter.* The generative attribute, symbolized in most ancient times by the Zodiacal Bull butting with his horns against the Mundane egg, and in later art by more gross forms,† was supposed to be especially developed at the vernal equinox. Hence, in the Scandinavian mythology, the Sun was fabled to recruit his strength by sucking the white cow Adumbla, the symbol of the productive power of the earth, said to have been the primary result of warmth operating upon ice,‡ a fable manifestly in analogy with the spirit of Sabæan art. The Bull of the Zodiac was thus regarded as the sign or cause of returning life and vigour of regeneration, or in fact of recreation.§ Now, says R. P. Knight,‖ speaking of a mode

* Thus in the mythological arrangement preserved by Manilius (derived originally from Sabæan principles) Venus, the passive principle of generation, had her mansion in Taurus :—

"Taurum Cytherea tuetur."—*Manil. Astro.* ii. p. 439.

† "Jamais les institutions religieuses n'ont eu dans leur commencement la depravation des mœurs pour motif. Il faut donc chercher ailleurs cette origine." Des Divinites génératrices, ou du culte du Phallus.—*Paris*, 1805. This remarkable volume, which has come into my hands since writing this essay, traces very clearly the gradual corruption of the pure symbolic adoration of the Zodiacal Bull, through its descending phases of worship of a material animal, and finally, a characteristic part of the animal. Hence undoubtedly the veneration of the Phallus—a worship which in its origin was pure and sacred, but which from its very nature could not continue so — a worship which has extended itself over the habitable globe, and the abuse of which has been the ruin of every nation, which having once cultivated it, could not fail to fall into excesses the most incredible, and the most horrible. It was this worship which was a constant snare to the Jews, as we learn by innumerable allusions in the Old Testament; and it is this worship which is still rampant in Hindostan, and while on the one hand it cannot be canvassed above a whisper, on the other, it effectually prevents the evangelization of a people by whom the foulest, the most unredeemable vice, is committed as a passport to heaven, and under the guise of Religion.

‡ Olãus Rudbeck. Atlantica, quoted in Knight's Inquiry, Sect. 53.

§ Hence Dionysus, the Greek Bacchus, the Sun of corrupted mythology, is called ταυροκεφαλος in Orph. Hymn. li. 2, and in the Bacchæ of Euripides, Pentheus says to Dionusos

καὶ ταῦρος ἡμῖν πρόσθεν ἡγεῖσθαι δοκεῖς.—*Bacch.* 920.

Compare with this the Invocation to Bacchus in Sophocles' Antigone (1146) where the Chorus exclaims,

ἰὼ πῦρ πνει-
όντων χοράγ' ἄστρων.

‖ Knight's "Inquiry," &c., Sect. 78.

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of astrological prediction which seems, he adds, to have been originally Chaldæan "the act which gave existence, gave all the consequences and effects of existence, which are therefore equally dependent upon the first cause; and how remote soever from it, still connected with it by a regular and indissoluble chain of gradation." This first cause, as I before observed, they referred to the sign representing it; so that the commencement of the year, and the return of the vernal equinox, was considered by them an event of the utmost importance, the greatest of astronomical epochs.* This return then being marked by the coincident rising of the Sun and of Taurus, the Bull was regarded as the leader of the Saba-oth, or host of heaven, and Aldebaran† received its name as signifying the *leading star*.‡ And again, since "the general movement of this great whole was supposed to be derived from the first impulse," the symbol of the Bull became of the most significant import to a people with whom astronomy was synonymous with astrology.§ There cannot be much question, says Greswell, that the ancient tradition and belief of the Persians connected not only the origin of time, but the origin of things, with the sign of the Bull.

Hence the veneration it received, and thus I would account for the fact of the Bull being the symbol of the

* La reconnaissance populaire, et les hommages rendus au dieu du jour, au soleil ramenant le printems, se dirigèrent naturellement vers un objet plus à la portée des sens, vers le signe du Zodiaque qui en etait le symbole, vers le signe du *Taureau* qui, participiant en quelque sorte à l'action du soleil régénérateur, fut à cet egard identifié a cet astre.— *Des Divinités Génératrices, Paris*, 1805, *p.* 5.

† The earliest sidereal observation of the Egyptians is one of Aldebaran.—*Greswell.*

‡ It is not a little remarkable in connection with this subject, that the Hebrew letter א, which is the same as the Chaldee, signifies a bull in the connection of a leading animal—"*dux* a leader—*bos*, a bull, or the chief of cattle."—See "Fresenius' Lexicon." "A," says Court de Gibelin (Monde primitif. Allegor. p. 80), "prononcè Alph, l'alpha des Grecs, signifie dans ces anciennes langues, un *bœuf*."

§ Le signe de la constellation céleste qui portrait ce nom (Taureau), représenté sur les Zodiaques artificiels, fut considéré comme le symbole du soleil printanier, du soleil regenerateur de la nature.—Divinités génératrices.

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Assyrian empire — that land in which the Zodiacal sign first obtained a position of such vital importance in the Sabæan system, and from which its worship radiated to the remotest confines of the habitable globe.

Before proceeding any farther with the subject, I will call attention to the sculptured Bulls of Assyria, which have been the cause of these remarks. These differ from all other known composite figures, in their possessing a human head, surmounted by the horned cap; and being, in addition, winged.* Sir Henry Rawlinson, in his religion of the Babylonians,† asserts that the man-bull is the emblem of a doubtful god, whose names, read phonetically, are Bar, or Nin-ip. This god he, etymologically, connects with Saturn; and moreover, he gives a few out of the hundred titles by which he is known; of which are — the supreme god; the first of the gods; the eldest son; the light of heaven and earth; he who, like the Sun, the light of the gods, illumines the nations. But this acute scholar "supposes the Assyrian year to commence with Aries," and therefore it cannot be a matter of so great surprise that he disregards the significance of the Zodiacal Bull. And yet one cannot help wondering, that great authorities like Rawlinson and Layard should so utterly cast aside astronomical assistance, and endeavour to thread the mazes of these remote eras without the aid of a key so interesting and so important as it affords. There are many who have rendered important service in the elucidation of this subject; but in this country few have been more sagacious, considering the small materials at his command — few more penetrating than the late Mr.

* A winged bull from Egypt is figured by Denon, pl. 129.

† "Rawlinson's Herodotus," vol. i. p. 619. In reading this undoubtedly erudite Dissertation, I could not help thinking of a passage in the work of old Gregorie, where he says, "But, as in their Gods, so in the names of their Gods, he that readeth shall find notable confusion."—*Rise and Fall of the Assyrian Monarchy*, p. 121.

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Landseer, whose volume of "Sabæan Researches" is a model of acuteness. But it has always been a matter of surprise to me that Layard, surrounded by interesting cylinders similar to those which Landseer so admirably elucidated, should be content to dismiss his ingenious researches with a line which savours less of acknowledgment than of unappreciating indifference.*

The heliacal rising of Taurus was symbolised by the ancient Assyrians, by placing a disc of stone or metal representing the Sun, between the horns of the Bull. Many such sculptured Tauri are still extant, of Phœnician and Assyrian workmanship; and we are not left merely to speculate as to the signification of the disc, for Herodotus (Euterpe. c. 132) describing the image of a cow at Sais, tells us that "*μεταξὺ δὲ τῶν κεράων, ὁ τοῦ ἡλίου κύκλος μεμιμημένος ἵστατι.*" This disc was of stone or metal, and was often moveable, and probably placed *in situ* at the great vernal festival, for which purpose a deep square hole was cut in the head of the bull. Such appearances are by no means uncommon † in the remains of ancient art which have come down to us. Now, in the celestial sphere, the head of the Bull is that part of the asterism which was turned towards the constellation Gemini, consequently the part which in the most early age was first reached by the Sun. In later periods of art, we find the disc transferred to the back of the animal, as in the oblong Zodiac of Denderah, marking the gradual recession of the equinoxial point through the sign — and proving further, that precession was known and observed at a very early age. It becomes highly probable that the Brahmin Bull, so extensively worshipped in India, and which has a hump upon its back, derives its claim to adoration from that significant circumstance. Such a bull appears to have been known

* Layard. "Discoveries in Niniveh and Babylon:" Second Journey, p. 609, note.
† Knight's "Inquiry," sect. 32.

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in Babylon (whence its worship probably spread to Hindostan), a small bronze figure of one having been brought from thence by Captain Lockett; and in Rosellini's plates (xx.) is a figure of a true Indian Bull, copied from a Theban tomb. At the same time it must be conceded, that we cannot determine the date of the monument solely by the position of the solar disc, for so accustomed were the ancients to the tradition of the Bull being the leading sign, that we find Virgil, as before quoted, so writing, although astronomically it had in his time ceased to be a fact for nearly 400 years; just as we, at the present day, speak of the coincidence of the first point of Aries with the vernal equinox, although it is in fact more than 30° removed from that point.

Now the *Sun*, and the *King of Heaven*, were one and the same at Babylon,* and called Bel or Baal;† and I would suggest in explanation of the human head — the placid bearded face which surmounts the taurine symbol, that it represented this same god Bel, and signified precisely the same as the moveable disc between the horns. How could the Assyrians, I ask, in representing this grand conjunction of the Sun, or Bel, with the constellation Taurus, more aptly personify the great Intelligence in which they seemed to "live, and move, and have their being," than by placing the "human face divine" in the situation ordinarily occupied by the solar disc?

In later times, notwithstanding that the custom of speaking of the Bull as the leading sign was preserved, the mythology, of Egypt especially, underwent a change,

* Landseer. "Sabæan Researches," p. 139. Compare also the fourth inscription of the Heliopolitan Obelisk, which begins "Helios, the great God, the Lord of Heaven," &c.

† "Belus (the successor of Nimrod) perhaps first called the sun so, and himself afterwards; as Nimrod did the sun by the name of Bel; which name the sun still kept in Phœnicia long after these times, for there they called the Sun Baalsemen, that is, the Lord of Heaven."—*Gregorie, "Assyrian Monarchy."*

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owing to the recognition of Aries as having supplanted the former constellation. Hence arose all the forms of Ammon, and avatars of Jupiter in the form of a Ram, which so much tended to the confusion of later mythology. The meaning of these monuments in which the Ram takes a prominent position is precisely the same as those of the Bull, except that they belong to a more corrupt age. In Æthiopia, and some parts of Egypt, it appears to have received as much veneration as the Bull had done before it, although the cause was as little generally known. In Egypt, colossal rams are met with in abundance; the great palace of Karnak was approached by two avenues, one of rams, and the other of crio-sphynges, all of colossal size, monoliths, and to the number of many hundreds; the stupendous scale of the Egyptian monuments being nowhere more remarkable than in these majestic approaches.* Many of these rams' heads are hollowed out for the reception of the solar disc — one such, the head of a colossal crio-sphynx which appears to have formed part of the above avenue, is in the British Museum. Among Mr. R. P. Knight's bronzes in the same collection, is a small ram-headed human figure, which may be regarded as similar in meaning to the human-headed bulls, being Jupiter represented by the human form "godlike, erect," surmounted by the symbolical head of the Ram.† I am not aware of the existence of any symbolical rams in which the solar disc is placed in any other position than between the horns; nor could we expect it to have been transferred to the back, until A.D. 700 or 800, by which time all those nations which acknowledged the change from the Bull to the Ram had perished.

Before passing on to any other portion of the subject, I will venture a few remarks concerning the wings with

* Denon. pl. 44.

† Compare Herod. Euterpe. c. 42.

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which the Assyrian Bulls are furnished. These appendages, although in the composite figure before us, they are placed in that position which we might conceive natural to the animal, belong, I imagine more especially to the solar part of the composition, and render it equivalent to the winged disc or globe, which we so often meet with in Egyptian symbolic art. In the most ancient Babylonian cylinders, the wings are figured in a more rude and simple manner, so that they would seem to be composed of rays of light, or sunbeams, and are thus "appropriate to the sun, as denoting that light was either its moving power, or was produced by its motion." So in an Orphic Hymn (v. 5,) where the Sun is evidently referred to under a symbolical name, we read

παμφαὲς ἔρνος

* * * * *

πάντη δινήεις πτερύγων ῥιπαῖς κατὰ κόσμον
λαμπρὸν ἄγων Φάος ἀγνὸν.

And following out the analogy which I have endeavoured to trace between the Assyrian Bulls and the Ammonian Rams, it may be mentioned that in the great French work on Egypt,* the Ram of Ammon is represented *winged.*

But although the Bull is the emblem most frequently met with, and most strikingly prominent in the Assyrian sculptures, there are others which cannot be passed over in silence. Bulls of a colossal size are accompanied by winged Lions, which rival them in magnitude, and are clothed with the same attributes; and the smaller Bulls on the walls of the temple, are generally observed to be placed in juxtaposition with three other emblems, viz.— a lion, an eagle, and a man; and these four figures, while they occur under various modifications in all parts of the temple, are placed upon the walls, separate and distinct,

* Egypte. Planches, vol. ii.

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and in the above order. Now the mind cannot long dwell upon this combination without being at once led in two very different directions. In the first place, the Zodiacial sign Taurus being supposed to mark the Sun's place at the vernal equinox, it follows that the solstitial colures, as well as the autumnal equinox, would be placed in different signs from those which mark them in our times. Thus the summer solstice would be in the constellation Leo, the autumnal equinox in Scorpio, and the winter solstice in Aquarius. Now the ancient Sabæists divided the twelve signs into tropical, fixed, and common; the *tropical* were those in which the seasons began to change — Aries, Cancer, Libra, and Capricorn — the *fixed* were the strongly characteristic or typical signs which marked the equinox and solstices — and the *common* were those intermediate between the other two. As we might suppose, the fixed signs were those which received most veneration, and in these were placed the four *royal stars*, as they were termed, viz.—Aldebaran, the leading star, in Taurus, Regulus* in Leo, Antares in Scorpio, and Scheat in Aquarius.† Here, however, we find a discrepancy, which it will not be easy to clear up. The Eagle has no representative in the Zodiac; the place to which we should look for it is evidently that occupied by Scorpio, a sign which for a long period occupied the space of two — the body and claws stretching across 60°. It was afterwards contracted to make room for the more appropriate sign of Libra, which well signifies an equinoctial point, where day and night are equally balanced. I meet, however, with the following statement in Landseer,‡ which, inasmuch as I cannot find the original reference

* Regulus was so named by Copernicus; it was called Βασιλικος by the scholiast on Aratus; and *stella regia* by Pliny.

† Duncan. "Religions of Profane Antiquity," p. 24.

‡ "Sabæan Researches," p. 331, note.

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I will take on his authority. He says, "Sir William Drummond goes near to demonstrate on the authorities of certain Hebrew writers, and of scriptural facts, that the stars which are now those of Scorpius, had been constellated as an Eagle in the Zodiac of Abraham and his grandsons." I must confess, however, that I know of no direct evidence of this theory; while at the same time I would call attention to the curious and significant fact, that the constellation Aquila, is the paranatellon of Leo.

But while on the one hand the attention is drawn to the Zodiacal signs by the sculptures of the Assyrian temples, on the other it is directed in a singular manner to certain highly figurative passages, both in the Old and New Testaments. The vision of Ezekiel* has puzzled commentators as much or more than any other of the prophetic parts of Scripture, and the remarkable description of the heads of the Cherubim admits of no rational explanation upon known principles. "As for the likeness of their faces, they four had the face of a man and the face of a lion on the right side; and they four had the face of an ox on the left side; they four also had the face of an eagle." We naturally recur to a precisely similar passage in the book of Revelations, where the Apostle is describing the four beasts which were round about the throne.† "And the first beast was like a lion, and the second beast was like a calf, and the third beast had a face as a man, and the fourth beast was like a flying eagle." In the case of Ezekiel's vision, it is set, as it were, in the midst of denunciations against Israel for her abominations, as her imitation of the idolatries of her captors was termed by the prophet. Ezekiel had been carried away captive by the Babylonians, under Nabopo-

* Ezekiel, i. 10, and x. 14.
† Rev. iv. 7.

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lassar, along with Jehoiachin, King of Judah, and was evidently in the midst of a colony of his own people on the banks of the river Chebar (Chabour). The earlier chapters of his prophecy are generally considered to relate to the impending punishment of his nation and the destruction of Jerusalem — but commentators are in general sadly at fault in their attempts to explain the details of his wonderful visions as related in the first, eighth, and tenth chapters. The eighth chapter is especially interesting. It is evident that he had been an eye-witness of the Assyrian mysteries, and that his vision of the Cherubim alluded to the leading symbols of their worship, though I am not prepared to say in what connection. With regard, however, to the eagle and the eagle-headed figures, so often noticed in the Assyrian sculptures, it may be observed that not a few* have been inclined to identify this figure with a god mentioned in the 2nd Kings, xix. 37, where Sennacherib was said to be "worshipping in the house of *Nisroch* his god;" for NISR in all the Semitic languages signifies *an eagle*.†

A remarkable passage occurs in Gregorie's "Rise and Fall of the Assyrian monarchy."‡ He says, "who or what this Nisroc should be, is so doubtful, that Peter Martyr could find nothing in all the ancient writers to explain the matter; his own opinion dependeth upon the etymon of the word *Nesrac*, which signifieth, as he saith, *Deum fugæ mollis*, a God or a Jove Φύξιος, whither, as to a sanctuary, Sennacherib might betake himself: it may be so. I rather suppose, if I may be so bold, that RAC in this place signifies the Sun; for so this people sometimes called the Sun — as Francis Junius hath noted upon SHADRAC in the prophet Daniel. So then this temple

* As Layard. "Nineveh and Babylon," 1st Journey, vol. ii. p. 459.

† "Majores (aquilæ) Arabico idiomate *Nesir* vocantur."—*Leo African: Descr. Afr.* ix. 66.

‡ 1683. Barker's supp. p. 120.

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was an asylum built at Ninive, to the honour and under the protection of the Sun, who was therefore called Nesrac, that is the *sun of flight*, for the reason given." So far Gregorie; and I would direct attention to another reason why the "sun of flight" should be an appropriate name to the eagle, if he really were what I have imagined him to be, viz. — the autumnal sun, crossing the colure of the *descending* equinox. This is a coincidence not a little curious, as supporting the somewhat defective evidence concerning the Zodiacal Eagle.

In the 8th chapter of Ezekiel, in which the "image of jealousy" and the "chambers of imagery" are described, we have an account of the interior of one of the mysterious temples of Assyria, and of the worship which the Jews had either joined in, or imitated for themselves. "When I looked, behold a hole in the wall * * * * so I went in and saw, and behold every form of creeping things, and abominable beasts, and all the idols of the house of Israel pourtrayed upon the wall round about. * * * Then he brought me to the door of the gate of the Lord's house, and behold there sat men and women weeping for Tammuz." It is highly probable, that what the prophet saw in the chamber of imagery, was the constellations figured upon the walls — beasts, clean and unclean, and creeping things, arranged perhaps like a concave planisphere, for purposes of worship. There can be little doubt that such things were used in the celebration of mysteries, and that sometimes merely the asterism or congeries of stars was pourtrayed, and at others the figures which they were supposed to represent, such as we see them marked on a celestial globe. Such an idea explains the remarkable words of Proclus, who writing in the fifth century upon the Polity of Plato says: — In all initiations and mysteries, the gods exhibit themselves under many forms, and with a frequent change of

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shape—sometimes as light defined to no particular figure (*i.e.* constellations as we *see* them) — sometimes in a human form, and sometimes in that of some other creature" (*i.e.* as constellated figures). Perhaps, had Proclus written this passage at an earlier age than he did, he would not have escaped punishment for his temerity.

The limits of this paper will not allow me to refer to the *weeping for Tammuz*, an astronomical mystery, for Tammuz is synonymous with Adonis and Osiris, and the mourning for him was doubtless connected with the disappearance of an asterism which Landseer gives strong evidence for identifying with Böotes, the husbandman, or constellated patriarch Noah.

Before concluding, however, I must touch upon one symbol not unfrequently met with in the Assyrian sculptures; I mean the pomegranate. Besides its occasional occurrence upon the monuments in question, the ancient statues of Juno and Proserpine sometimes held a pomegranate in the left hand, of which Pausanias says, *τα μεν ουν εις την βοιαν (απορρητοτερος γαρ εστιν ὁ λογος) αφεισθω μοι.*[*] It is evident from this that it was a religious symbol of some importance, which he was fearful of betraying. In the Second Book of Kings, v. 18, we read of the King of Syria worshipping in the house of *Rimmon*, which word literally signifies a *pomegranate;* defined also by various authorities as the exalted one; — the exaltation and breaking forth of divine light. The form of a pomegranate might not unnaturally be chosen astronomically, to signify the conjunction of a star with the Sun, the large calyx giving the appearance of stellar rays surmounting a disc, which we know to have been emblematical of the sun. It might thus have had the same signification attached to it as the winged bull, viz. — the conjunction of Aldebaran with the Sun at the vernal equinox;

[*] Pausanias. Corinth. c. xvii. s. 4.

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or the winged Lion, *i.e.* the conjunction of the Sun with Regulus at the summer solstice. Respecting the pine cone in the hands of the Eagle-headed figures, I can say nothing with certainty. It was long afterwards a symbol consecrated to Bacchus, though no writer with whom I am acquainted gives any satisfactory account of its origin or meaning. The thyrsus so frequently wielded by the Bacchants, is usually surmounted by it, though almost as frequently with the ivy or vine-leaf with which it appears to be interchangeable. Payne Knight imagined that the cone surmounting the thyrsus, or in the hand of Ariadne, signified the same as the pomegranate in the hand of Juno, or the sacred tau in that of Isis; but he had not met with the Assyrian cones.

My limits, however, will not permit of my dwelling any more at length upon these subjects. Enough perhaps has been said to prove that these symbols have a meaning, and that a deep and significant one; and the more we endeavour to penetrate beneath the protean exterior of ancient fable, the more we shall be struck with the depth of philosophy (doubtless mingled with error) which it exhibits. At all events it is my conviction, that the earlier myths are founded upon grand natural truths; and although the thirst for dominion and power led the ancient depositaries of secrets to conceal them with a jealous guardianship — that mysterious veiling of philosophy — that attempt to restrain truth to the narrow circle of a few initiated — succeeded but too well; and has had the effect of retarding science, of sowing confusion and discord among the otherwise harmonious systems of ancient religions and mythology, and of bequeathing to posterity erroneous ideas of the frivolity of the ancients (to call it by no worse name) which the modern mind will hardly be at the pains to correct. Still, enough has escaped the vigilance of the priesthood, to show

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that philosophy and not caprice was their guide; and I coincide with the opinion expressed by the great Lord Bacon, who, piercing with his keen glance through the dense veil of fable with which these systems are overlaid, says — "I am not ignorant how uncertain fiction is, * * * but let not the follies and license of a few lessen the esteem due to parable, for that would be profane and bold, since religion delights in such veils and shadows; but reflecting on human wisdom, I ingenuously confess my real opinion is, that mystery and allegory were from the original intended in many fables of the ancient poets." *

ELEVENTH ORDINARY MEETING.

ROYAL INSTITUTION, 21st March, 1859.

THOMAS INMAN, ESQ., M.D., PRESIDENT, in the Chair.

Mr. BROOKE exhibited a specimen of copper ore, and drew the attention of the meeting to the fact, which is little known, that a valuable and productive copper mine is now being worked within thirty miles, as the crow flies, from the spot where the meeting was then held. He had procured the ore in the preceding week from the mass in the mine, which is upon part of the estate of Lord Stanley of Alderley, at Alderley-edge, in Cheshire. He mentioned that in the last, and also early in the

* Bacon. "Wisdom of the Ancients," Preface.

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present century, mines, both of cobalt and copper had been worked there, but with ill success. Having some property in that neighbourhood, he had formerly often visited the old copper mine at Alderley, which at that period remained almost forgotten, and the levels, adits, or openings, which the miners had driven into the hill, in search of copper ore, being neglected, though occasionally visited from curiosity; but that a gentleman of talents and experience in mining, had recently made an arrangement with Lord Stanley of Alderley; but that last year when he was there, he saw that considerable progress was being made in working it.

Mr. ARCHER gave some interesting information relative to the experiments going on at the Crystal Palace for the artificial hatching of salmon spawn, with a view to the propagation of the species in Australia. He had had an opportunity of witnessing the results of these experiments, and had seen the fish leaving the eggs at the rate of forty or fifty in an hour. The mode of operation was to keep a stream of filtered water constantly running over the spawn till the vivifying process was complete. It had been calculated that this would occupy sixty days, and as that was about the length of a voyage to Australia, the chances were, that the fish might be landed in sufficient time to insure their preservation. It has been found, however, that by the artificial method they made their appearance in twenty-nine days, which it was feared would considerably interfere with the success of the experiment. The great difficulty was in keeping up a constant stream of fresh water, as the filters were liable to get out of order, causing the supply to fall off.

A paper was then read of which the following is an abstract: —

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ON THE

MARINE ANIMALS OF THE MERSEY SHORE.

By JOHN BAKER EDWARDS, Ph.D., F.C.S.

It is my purpose to-night to offer myself as your guide to the Mersey shore, in the choice of species for the Aquarium, and of localities for their capture.

The Aquarium before you is of about three years' standing, though some of the contents have been longer in my possession in another vessel. For the last two years the water has never been changed or renewed, beyond occasional small additions and abstractions. The species are very numerous, and the whole are in perfectly healthy order. It is about six years since I first commenced the attempt to establish an aquarium of our shore, and my early failures were so numerous that I should scarcely have persevered had I not witnessed the remarkable success of Mr. Warington, who, I consider, first established and defined the conditions of success, and who, up to the present time, has been most fortunate in his management even of delicate species. The estuaries of the Mersey and the Dee open, as you are aware, to the north, and from the denudation of the red sandstone, are much broken up by immense sandbanks; these are constantly shifting, and the opposed shores therefore suffer great changes from stormy weather; the sandy shore, from this cause, is exceedingly barren in marine life. Off the Wirral coast little indeed can be obtained, beyond shrimps, prawns, crabs, and jelly-fish. Off the westerly point of Wirral stands a double point of rock, called Hilbre Island, and The Little Hilbre, which are remarkable for the richness of their fauna and flora. On the northerly

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and westerly side of Hilbre, at low ebb, a wonderful hunting ground is discovered, which once seen will not easily be forgotten, and which in richness and variety of species far exceeds any point of our coast. It is somewhat difficult of access, but more than repays a well-timed visit. This should be at spring tides, with a nineteen or twenty foot ebb, the weather calm, or a steady wind from the northwest; for the tidal wave travelling in a northeasterly direction, is held back by a northerly wind, and the reflux is detained. The hour of such an ebb is six a.m. or six p.m.; and in order to secure all the spoil, it is desirable to be upon the ground about an hour before low water; earlier than this the sand is scarcely fordable. I shall not attempt to recount the glories of the place, but will name a few of the species which you should secure: — *Actinoloba dianthus*, abundant and variegated; *Actinia mesembrianthymum*, rare; *Sagartia anguicoma*, *Sagartia candida*, *Sagartia miniata*, *Sagartia troglodytes*, several varieties; *Aphrodita*, *Terebella*, and *Sabellaria*; *Amphitrite ventilabrum*, abundant; *Tubularia indivisa*, very abundant; *Coryne pusilla*, and other small zoophytes; Hermit, Spider, and Porcelain Crabs; Æsop and common Prawns; Rock-fish; Nudibranchs in great variety; *Acalephæ* various. Similar species are to be found on the Caldy Blacks, in the estuary of the Dee, beyond West Kirby; but owing to the rapid turn of the tide, and the deceptive appearance of the channels, the visit is not free from danger. Returning to our immediate shore, I invite you to the rocks below the lighthouse at New Brighton. Here we shall find, at a good ebb, a low shelf of rock, full of little pools of clear water, in which will be found a variety of microscopic zoophytes, a few nudibranchs, in calm weather *Sagartia troglodytes* and *S. candida*, while the whole surface is thickly strewn with *Actinia coriacea*, now considered identical by Gosse with *A. crassicornis*—large specimens of the

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latter species are however but rarely found, although the small variety is in such abundance. These are quite unsuitable for the aquarium. A small variety of *Sabella* is also found here, the head having a single ray only, and the colours far less brilliant than the larger variety at Hilbre. *Sabellaria alveolata* is also abundant here. A little beyond the lighthouse, towards the shore, is some muddy soft sand, in which a few largish holes will be observed; on cutting round these, and getting the knife down to the rock, the actinia, which is *S. troglodytes*, may be securely captured. About the lighthouse are some nice varieties of sea-weed, Ulva and Enteromorpha chiefly, which should be selected, attached to small portable masses of stone. The rock pools about the fort will be found rarely to contain any thing worthy of preservation, except a few rock-fish. The black and freckled Goby, the spotted Gunnel, and bearded Rockling, are hardy examples, which may be taken with a hand-net. Young fry seldom live long in the aquarium, and large fish should never be attempted. On the shore, immediately below the New Brighton Ferry, is a steep sand-bank, which extends some yards. On this bank, an hour or two before low water, the lovely New Brighton "gem," *Cydippe pileus*, may be found during most of the summer and autumn seasons. If just stranded, it should be carefully lifted with the sand in contact with it, and put into clear water; it will, by its beautiful cilia, soon free itself from the sand, and in a large jar of sea-water will live for some weeks, displaying most elegant motions; if placed in the aquarium it immediately falls a prey, being I suppose deemed a delicate morsel by the actinia. I have found this elegant creature all along the shore as far as Eastham. South of New Brighton the shore is sandy and barren for about halfway towards Egremont, where we meet with large mussel beds, which

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being founded on soft mud, require some care in crossing them, but at low water mark we meet with hard sand, covered with loose stones, the larger of which, on being turned over, discover many interesting nudibranchs — *Eolis papillosa*, *E. Drummondi*, *E. aurantiaca*, *E. picta*, *E. dispecta*, *Doto coronata*, *Dendronotus arborescens* (always on or near *Tubularia indivisa)*, *Doris tuberculata*, *D. Johnstoni*, *D. bilamellata*, *D. aspera*, *D. pilosa*. In the shallow pools and channels many interesting species will be found. Nearing Egremont Ferry we approach the large bed of Sponge, *Halichondria panicea*, and thereon find many varieties of hirsute and hermit crabs, &c., and the Brittle-star. This sponge will not live in the aquarium, and soon poisons the water if allowed to die in it. In a large shallow pool there, about ordinary low water mark, is a large solitary boulder of limestone. Upon this stone, and in a tidal line from thence, are found thousands of *Purpura lapillus*, in great variety of colour and form, also *Buccinum undatum* abundantly, with masses of egg capsules in the same locality. For a short distance south of Egremont the ground is of a similar character, but soon becomes, near Seacombe, sandy and muddy, good only for annelids. South of Seacombe the shore is approached by steps from the dock wall. About half-way between these steps and the ferry will be found a hollow cave in the wall, and depending from the roof of this cave is a large colony of white *A. dianthus*, which may be obtained at an ordinary ebb. The shore here is not very productive, but the brown fucus on the wall furnishes some parasitic zoophytes, and *Doris bilamellata*. Half-way to Birkenhead Dock is a wooden aqueduct, with a dribbling stream flowing therefrom. The bottom of this wooden channel is covered with zoophytes, *Tubularia gracilis* and *Clava multicornis*, in very fine condition, and many microscopic varieties. These

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require agitation, and do not thrive in the still water of the aquarium. On a rock just below this point I once found a little pool containing above twenty large brick-red specimens of *Eolis Drummondi*, and as many of *Dendronotus arborescens*. We now make a detour by the railway, skirting a mud basin, which however often catches a few Cydippes, and swarms with minute crustaceans. At the extremity of the bay, some pretty clean shells and fragments are washed up. At the base of the Birkenhead Dock wall are some large masses of stone, and myriads of *Doris tuberculata*, *Dendronotus*, and other nudibranchs occasionally, and a few small zoophytes. A muddy basin lies between this spot and Woodside Ferry, visible only at very low ebbs, is a good locality for *Tubularia*, small zoophytes, *Dendronotus*, and nudibranchs. Monk's Ferry slip although difficult of access well repays a visit at a good calm ebb. On the north side, within a few yards of the pier and upon it, I have found nearly all our species of nudibranchs, and often in great abundance, *Doris tuberculata*, *D. Johnstoni*, *D. pilosa*, and *D. aspera*, *Eolis papillosa*, *E. Drummondi*, *E. coronata*, *Doto coronata* and *Ancula cristata*. On this side of the pier will be found fine buff varieties of *A. dianthus*, while upon the southside is an immense colony of the white kind. A large quantity of *Tubularia* is also growing on this side, covered with bread sponge, and associated with them the usual parasites. A little above this I have often taken an olive green actinia, with spotted skin and white markings round the mouth, which I have not been able to identify with any described. Above Birkenhead Ferry the ground becomes too muddy to repay your search; so we will take our leave of Cheshire and cross the Mersey. We halt at the landing-stage, get under the bridge at the north end and peep at the pontoons. If the weather has been calm, and the

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boxes near at hand have not been recently scraped, we find large beds of mussels, covered with remarkably fine *Tubularia*, and seeking the services of "Old Peter," who "knows 'em," and is furnished with a long-handled iron scoop, we turn over the muddy treasures he pours at our feet more rapidly than we can examine them. In this way we once obtained above forty specimens of *Dendronotus* in a quarter of an hour, besides other nudibranchs and zoophytes. Here I might almost consider my task ended, for the Liverpool side of the Mersey has a very muddy and unproductive shore. An adventurous spirit may, however, follow me to the Dingle Rocks, opposite the grounds of John Cropper, Esq., which furnish *Tubularia* in great profusion and richness, with its usual parasitic nudibranchs. White *A. dianthus* is very abundant but the buff variety very scarce. A light brown uniform coloured actinia, of which I have found several here, I have not been able to identify. It lives well in the aquarium. *Coryne pusilla* is abundant; also *Clava*, and a species of *Hydractinia*. *Cydippe* is also found in the summer.

In conclusion, I would offer a few words of caution to inexperienced collectors, who, during a brief visit to the sea-side, determine to establish an aquarium.

It is a mistake to suppose that every curious animal which you gather in your rambles on the beach will live and thrive in a confined space, placed under artificial conditions of light, atmosphere, and temperature. Nor is an aquarium a toy resembling a picture book, which you may buy complete, and put by, and find always in the same condition when required for exhibition to admiring friends. To maintain an aquarium in a healthy condition from year to year, it must be placed under the regular observation of the owner, who must study the habits and wants of the species he associates together,

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and become a naturalist practically and *con amore*. Excess of light, excess of food, excess of temperature, and overcrowding of individuals, are the usual faults which upset the balance of life in the aquarium. An observant eye detects the first symptoms of disorder, and promptly removes the defect, but when neglected for a day or two the mischief becomes serious and the remedy troublesome. A few minutes of daily observation and attention insure success, but a week's neglect will sometimes entail a day's work to rectify. The beginner should commence on a small scale, and cultivate his powers of observation. A shallow glass dish or white footpan is the best for the purpose, and the most perfect collections are maintained in a series of shallow vessels of a similar kind, which become nurseries for the aquarium. In such a vessel, about half filled with water, place a few fragments of rock, with growing weed attached, but avoid a large quantity of old weed; small young fronds answer best. Half-a-dozen actiniæ will make a good commencement, two or three crabs, shrimps, and rock-fish may be added; also two or three molluscs, such as purpura or periwinkles. This collection will afford abundant means of observation, and should be fed once or twice a week with fragments of small earth worms. Another vessel may contain actiniæ, two or three cockles and mussels, serpulæ or sabellæ, tubularia, and the smaller zoophytes, with a few nudibranchs.

Shrimps, crabs, and purpura are incompatible with this collection, for the crustaceans attack and disturb the annelids, and the purpura destroy the bivalves by piercing the shell and devouring the contents.

A tall glass vase with a small mass of weed and a few branches of small zoophyte, such as the Laomedea at the bottom, will preserve the *Cydippe pileus* for many weeks, and its elegant gyrations, render it a perpetual

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object of interest and beauty. Minute acalephæ may be associated with it, but it falls an instant prey to actiniæ.

Occasional äeration, by skimming the surface and pouring the water back again in a small stream through a funnel, is a very advantageous practise; but it is not desirable to put the whole body of water into violent agitation, as this disturbs the sediment and injures the small specimens. Not the least interesting feature in such collections, however small, is the occasional appearance of new and unexpected forms of life, which furnish a delightful field for microscopic research, and for curious observations upon the alternation of generation and other modes of development and reproduction. In a small fish globe I have thus observed the deposition of ova and subsequent development of several species of Eolis, and the attachment and gradual growth of new *Polypdoms* of *Plumularia* and *Serbularia*. Occasionally a swarm of *Hgdra tuba*, or of highly coloured *infusory animalcules*, which "come like spirits and so depart," vary the every-day life of the aquarium and stimulate the observer to closer scrutiny. Such observations, if habitually and accurately recorded, cannot fail to add new facts to Science. Let none despair by reason of a few failures, for success will follow judicious management, and all who persevere will be rewarded for their pains.

By the observation of a few specimens in separate vessels more is learned by the young naturalist than in a large aquarium, where objects disappear from causes unexplained and beyond the reach of observation. The knowledge thus obtained is the best guide to such association of species as will render an aquarium permanently healthy and attractive.

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TWELFTH ORDINARY MEETING.

ROYAL INSTITUTION, 4th April, 1859.

The REV. H. H. HIGGINS, M.A., Sen. V.P., in the Chair.

The resignation of the Rev. Mr. MALLESON was accepted.

The SECRETARY called attention to a copy of the epitaph intended to be placed on a monument to JEREMIAH HORROCKS, in Hoole Church, near Preston, where he officiated as curate, as follows:—

JEREMIAH HORROCKS,
BORN AT LIVERPOOL, EDUCATED AT CAMBRIDGE, THE CURATE OF HOOLE,
DIED IN THE 23RD YEAR OF HIS AGE, 1641.

THE WISDOM OF GOD IN CREATION WAS HIS STUDY FROM EARLY YOUTH:
FOR HIS WONDERFUL GENIUS AND SCIENTIFIC KNOWLEDGE,
MEN SPEAK OF HIM AS
"One of England's most gifted sons."
"The pride and boast of British astronomers."
AMONGST HIS DISCOVERIES ARE — THE NEAREST APPROXIMATION TO THE
SUN'S PARALLAX,
THE CORRECT THEORY OF THE MOON, AND THE TRANSIT OF VENUS.

BUT THE LOVE OF GOD IN REDEMPTION WAS TO HIM A YET NOBLER THEME;
THE PREACHING OF CHRIST CRUCIFIED A YET HIGHER DUTY;
LOVING SCIENCE MUCH, HE LOVED RELIGION MORE,
AND TURNING FROM THE WONDERS OF CREATION TO THE GLORIES OF
THE CROSS, HE EXPRESSED THE RULE OF HIS LIFE IN THESE
MEMORABLE WORDS —
"AD MAJORA AVOCATUS, QUÆ OB HÆC PARERGA NEGLIGI NON DECUIT."

IN MEMORY OF ONE SO YOUNG, AND YET SO LEARNED,
SO LEARNED, AND YET SO PIOUS,
THIS CHURCH, IN WHICH HE OFFICIATED, HAS
BEEN ENLARGED AND BEAUTIFIED.

The following paper was then read:—

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PRODUCTS OF THE MAMMALIAN ANIMALS AND USES TO WHICH THEY ARE APPLIED.

SUB-CLASS VIVIPARA: ORDER I. BIMANA.

GENUS AND SPECIES: HOMO — MAN.

BY THOMAS C. ARCHER, ESQ., V.P.

PROFESSOR OF BOTANY, QUEEN'S COLLEGE, LIVERPOOL.

"Don't go to weep upon my grave
And think that there I be;
They haven't left an atom there
Of my anatomie."

UTILITARIAN man cannot even allow his own species to mix with our mother earth and rest in peace, but must mutilate those remains which, when in life, possibly were "bone of *his* bone and flesh of *his* flesh." It is true, man as an animal does not yield much in the form of useful applications to the Economic Zoologist; yet there are two or three really important products derived from the human frame; and there are those who, perhaps, have passed lives useless to their fellow-creatures, but who furnish some very useful materials by their death. We do not mean after the manner of the Fijians; although, according to Mr. Missionary Williams, that is by no means an uncommon application of poor humanity. In describing those canibals, he says, there was one remarkable for his voracious fondness for human flesh, whose name was Ra Undreundre, of Rakiraki; but let the Rev. Mr. Williams speak for himself:—

"Even Fijians name him with wonder. Bodies procured for his consumption were designated *lewe ni bi*. The

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bi is a circular fence, or pond, made to receive turtles when caught, which then become its *lewena*, 'contents.' Ra Undreundre was compared to such a receptacle, standing ever ready to receive human flesh. The fork used by this monster was honoured with a distinctive epithet. It was named *Undroundro;* a word used to denote a small person or thing carrying a great burden. This fork was given by his son, Ra Vatu, to my respected friend, the Rev. R. B. Lyth, in 1849. Ra Vatu then spoke freely of his father's propensity, and took Mr. Lyth nearly a mile beyond the precincts of the town, and showed him the stones by which his father registered the number of bodies he had eaten 'after his family had begun to grow up.' Mr. Lyth found the line of stones to measure two hundred and thirty-two paces. A teacher who accompanied him counted the stones — eight hundred and seventy-two. If those which had been removed were replaced, the whole would certainly have amounted to *nine hundred.* Ra Vatu asserted that his father ate all these persons himself, permitting no one to share them with him. A similar row of stones, placed to mark the bodies eaten by Naungavuli, contained forty-eight, when his becoming a Christian prevented any further addition."

The most important product of the human frame is the hair, which in all ages, and amongst all nations, has been used for the decoration of those who are either naturally deficient of it, or who, in obedience to the requirements of fashion, need more of this beautiful natural ornament. Savage nations, in many parts, particularly in the Malayan Islands, use head-dresses, in which human hair is the principal material, for the purpose of increasing their warlike appearance; and the females of many uncivilised nations also use hair, manufactured into head-dresses, or intermingled with their own locks — even negresses have been described as wearing the longer locks

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of other women. The Chinese are said to wear even false beards when nature has been ungenerous to them in this particular. Usually the human hair has only been applied to the adornment of the head, or worked up into small ornaments, as souvenirs of lost or absent friends; but our old poets write of another application of this material, and Spencer has thus alluded to the legend of the mantle of human hair taken from the giant King Ryence by King Arthur—

"Not farre from hence, upon yond rocky hill,
Hard by a streight, there stands a castle strong,
Which doth observe a custom lewd and ill,
And it hath long mayntain'd with mighty wrong:
For may no knight nor ladye passe along
That way (and yet they needs must passe that way
By reason of the streight and rocks among),
But they that Lady's locks doe shave away,
And that Knight's beard for toll, which they for passage pay.

"'A shamefull use, as ever I did heare,'
Sayd Calidore, 'and to be overthrowne,
But by what meanes did they at first it reare,
And for what cause, tell if thou have it knowne.'
Sayd then that Squire: 'The Ladye which doth owne
This castle is by name Brianna hight;
Then which a prowder Ladye livith none;
She long time hath deare lov'd a doughty knight,
And sought to win his love by all the means she might.

"'His name is Crudor, who through high disdaine,
And proud despight of self-pleasing mynd,
Refused hath to yield her love againe,
Until a mantle she for him doe fynd,
With beards of knights, and locks of ladies lynd;
Which to provide she hath this castle dight,
And therein hath a seneschall assyn'd,
Cal'd Maleffort, a man of mickle might,
Who executes her wicked will, with worse despite.'"

Faerrie Queen, B. vi.

A famous ballad, sung at Kenilworth Castle before Queen Elizabeth in 1575, gives the more popular history of this mantle of human fur—

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" As it fell out on a Pentecost day,
King Arthur at Camelot kept his Court royall;
With his faire queene, dame Guenever the gay,
And many bold barons sitting in hall;
With ladies attired in purple and pall;
And heraults in hewkes, hooting on high
Cryed, '*Largesse, Largesse, Chevaliers tres hardie.*'

" A doughty dwarfe to the uppermost deas
Bright pertly gan pricke, kneeling on knee,
With steven full stoute amids all the preas,
Sayd, 'Now, Sir King Arthur, God save thee, and see!
Sir Ryence of North Gales greeteth well thee,
And bids thee thy beard anon to him send,
Or else from thy jaws he will it off rend.

" 'For his robe of state is a rich scarlet mantle
With eleven King's beards bordered about;
And there is room left yet in a kantle,
For thine to stand and make the twelfth out;
This must be done, be thou never so stout;
This must be done, I tell thee no fable,
Maugre the teethe of all thy rounde table.'

" When this mortal message from his mouth past,
Great was the noyse bothe in hall and in bower;
The King fum'd; the queen schreecht, ladies were aghast;
Princes puff'd; barons bluster'd; lords began lower;
Knights storm'd; squires startled like steeds in a stowr;
Pages and yeomen yell'd out in the hall;
Then in came Sir Kay, the King's seneschal.

" 'Silence my soveraignes,' quoth this courteous knight,
And in that stound the stower began still;
Then the dwarfe's dinner full deerely was dight;
Of wine and wassel he had his wille;
And when he had eaten and drunken his fill,
An hundred pieces of fine coyned gold
Were given this dwarfe for his message bold.

" 'But say to Sir Ryence, thou dwarfe,' quoth the King,
'That for his bold message I do him defye;
And shortly with basins and pans will him ring
Out of North Gales; when he and I
With swords, and not razors, quickly shall trye
Whether he or King Arthur will prove the best barbor;'
And therewith he shook his good sword Excalibor.

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In modern times the dresses of uncivilised warriors have been found similarly decorated. The tribes of North American Indians wear girdles fringed with the scalp-locks of their fallen enemies; and the natives of Borneo even decorate their shields with the locks of their foes, slain in battle.

Various tribes of the Australasian group use human hair for making very fine cordage for binding on fish-hooks, spear-heads, &c. Civilised nations employ human hair in the manufacture of wigs, false tresses, &c., and in making ornaments to serve as souvenirs of those whose locks are employed in the manufacture.

The first of these manufactures has long been an important one, and is of very ancient origin, an ancient Egyptian wig being amongst the rarities in the Ethnological department of the British Museum.

One of the most curious circumstances connected with the trade in hair, was the incorporation of barbers and surgeons as one profession, which was done in 1461, by charter, granted by Edward IV., not that the true chirurgeon practised as a hair-dresser and peruke-maker, or that the perruquier was allowed to act the surgeon except so far as assisting in, or performing the minor operations of bleeding, cupping, leeching, &c. This incongruous brotherhood, however, was broken up by Act of Parliament in 1745, in the 18th of George III.

The wig, like all other portions of human attire, has undergone a great many variations in fashion. In the present day the great object is, in the first place, as far as possible, to imitate nature, and deceive the eye; and secondly, to produce them of extreme lightness, in both of which respects our perruquiers succeed admirably — a full-sized peruke rarely being more than two or three ounces in weight. A full head of hair, from a young woman's head, will sometimes weigh five or six ounces.

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There are two heads of hair in the South Kensington Museum, which are in the raw state, as imported, and weigh together 11½ ounces.

We receive the chief portion of the hair used in this country through French dealers, who collect it from Holland and Germany, as well as from the various departments of their own country. The light colours are usually obtained from the former countries, and the dark shades from Brittany. This does not arise from the circumstances that these countries yield the finest heads of hair, but because the poverty of the people causes its sale to be a matter of importance, and the peculiar fashions of the country head-dresses render its loss of less consequence.

The mode of collecting it is thus described by Mr. Francis Trollope, in his "Summer in Brittany." Speaking of the fair at Collené, he says, "What surprised me more than all — by the singularity and novelty of the thing — were the operations of dealers in hair. In various parts of the motley crowd there were three or four different purchasers of this commodity, who travel the country for the purpose of attending the fairs, and buying the tresses of the peasant girls. They have particularly fine hair, and frequently in the greatest abundance. I should have thought that female vanity would have effectually prevented such a traffic as this being carried to any extent; but there seemed to be no difficulty in finding beautiful heads of hair perfectly willing to sell *(sic)*. We saw several girls sheared — one after another, like sheep — and as many more standing ready for the shears, with their caps in their hands, and their long hair combed out, and hanging down to their waists. Some of the operators were men and some women. By the side of the dealer was a large basket, into which every successive crop of hair was thrown. No doubt the reason of the indifference

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to their tresses, on the part of the fair Bretonnes, is to be found in the invariable mode of covering every head — from childhood upwards — which entirely prevents any part of the hair from being seen. The money given for human hair is about twenty sous, or else a gaudy pocket-handkerchief. They nett immense profits by their trips through the country."

The extreme beauty of hair — as a material for the manufacture of small personal ornaments — has led to a great development of this branch of industry; and consequently, to an increased consumption of human hair. Some very beautiful specimens of the art were exhibited at the Great Exhibition of 1851. One, a vase, 24 inches in height, and 18 inches in circumference, was entirely composed of human hair, except the mountings, which were of metal, gilt. This unique ornament, the manufacture of Mr. J. Woodley, was exhibited by the Messrs. Gass, of Regent Street. A beautiful bouquet of artificial flowers, each made of the hair of one member of the family who furnished it, was another of the curiosities exhibited to illustrate the application of this material; and Messrs. Lemonnier, of Paris, exhibited a beautiful portrait of our gracious Queen, formed of different shades of hair, which looked almost like a sepia drawing, and was greatly admired for its ingenious workmanship, and for its correctness as a likeness; besides these, there was a great display of rings, brooches, artificial flowers, and other souvenirs. The Paris Exhibition was particularly rich in these articles of taste, which excited much interest. Mr. Buckland, in his very interesting book "On the Curiosities of Natural History," thus alludes to another curious application of hair:—

"Human hair is, above all things, best calculated for making models of some kinds of dark-coloured snakes. I have observed in Farrer's shop, in Regent Street, where

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they work up hair into all sorts of devices, several very good models of snakes—black, white, and brown hair being intermixed, give exactly the appearance of the common viper. One hair snake, in particular, has its marks perfectly correct, whether by design or accident I know not, but there it is, the model of a viper, only unfortunately it has the ideal head fashioned by an unobservant artist."

The wholesale price of long hair is from 30s. to 60s. per pound, and the peasants of France alone supply 20,000 pounds, of the value of £40,000. The average imports, during the last four years from France (whence we receive the principal supply), has been 14,000 pounds, of the value of £28,000. Besides the imports from France, which chiefly comprise the darker colours, a considerable quantity comes from Germany, usually of light shades.

Next in importance, of the economic products of the human frame, are the teeth; these, if not worn out, as is too frequently the case by the original owner, can be made to serve a second time; and for this purpose the dead are often ruthlessly plundered. Formerly this was done to a much greater extent than at present, and the practise is rapidly diminishing, as the talent of the dentists, in producing artificial ones, is increasing: sets of natural teeth are, however, still in demand, and realise high prices. The trade in human teeth is considerable; but owing to the secrecy observed in carrying on this disgusting traffic, no correct idea can be formed of its real extent.

The teeth are not the only portions of the human skeleton which are turned to useful purposes; of late the arm and leg bones have been extensively used in France in the manufacture of tooth and nail brushes, which are largely exported to this and other countries: they realise a higher price than those made of ordinary bone, or even

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of ivory; for owing to their very great density, and the ease with which they bleach, they are susceptible of a beautiful polish, and are of a pearly white colour. It must be confessed, however, that any information which would make these brushes easily known is not desirable, as it is by no means a pleasant idea that we may be polishing our teeth with the leg of one of the martyrs of the Great Revolution.

"To what base uses may we return, Horatio!"

THIRTEENTH ORDINARY MEETING.

ROYAL INSTITUTION, 18th April, 1859.

THOMAS INMAN, ESQ., M.D., PRESIDENT, in the Chair.

THIS being the last Sessional Meeting the business was of a miscellaneous character, and in the various apartments of the Institution were placed objects of interest — miscroscopes, natural history objects, products of applied science, photographs, drawings, &c.

Mr. BYERLEY exhibited a portion of a shell of *Unio margaritacea*, presenting several minute portraits of the god Buddha, relieved upon the inner surface of the shell, and apparently formed by the animal itself. Mr. Byerley had received the shell from Dr. Bradley, the United States consul at Ningpo, and the explanation was, that small metallic impressions of the image represented had been inserted between the shell and the mantle of the fish while it was alive, which being subsequently coated over with calcareous matter, assumed the appearance of being original portions of the shell. At first the experiment answered all the purposes of a pious fraud, and was exceedingly profitable, as much as seven or

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eight hundred dollars being realised for a single shell; this however was so often repeated, that it gradually lost its charm.

During the short time in which the president occupied the chair, the Rev. H. H. Higgins offered some remarks on certain species of *Jania* and *Corallina* from the western coast of South America, specimens of which he exhibited. The genera to which the specimens belonged, he remarked, pertained to the *Rhodospermeæ*, the second group of marine algæ. They were included in the very natural order *Corallinaceæ*, characterised by the rigid, articulated, or crustaceous, and mostly calcareous, structure of the species. They are universally regarded as belonging to the vegetable kingdom, till the time of Ellis, who, from observing on their surface minute pores, which he regarded as polype cells, placed them among the zoophytes, an arrangement which was adopted also by Linnæus. Lamark, however, claimed the merit of being the first to appreciate their true affinities, which he professed to find amongst the corticated corals, *Gorgonia* and *Isis*. None of these naturalists however could affirm that they had seen the polype of the coralline, and Blainville at length fully established its true vegetable character. Dr. Johnston, in 1842, whilst complaining that British naturalists still remained in doubt as to the animal or vegetable nature of the corallines, confidently ranked them with marine plants. One of the grounds on which he came to this conclusion rather amusingly illustrates the progress of the aquarium. Dr. Johnston had placed in a jar, containing a small quantity of sea-water, a tuft of *Corallina officinalis* growing on its natural base, together with a frond of Ulva, and a few small molluscs and annelides, which were at large. In eight weeks the *Corallina* was thriving. He would quote Dr. Johnston's words: "What can be more conclusive? I need not say that if any

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animal, or even a sponge, had been so confined, the water would long before this time have been deprived of its oxygen, would have become corrupt, and ammoniacal, and poisonous to the life of every living thing." The vegetable structure of the *Corallinaceæ* might readily be seen if the plants were kept for a while in dilute muriatic acid, by which the lime was removed; sections might then be made, for microscopic observation. The reproduction of the *Corallinaceæ* had, so far as he was aware, only been observed to take place by means of tetraspores, compound organs of fructification seated in a cavity, situated at the extremity or on the sides of the branches. This cavity, which was termed a *caramidium*, opened by a minute pore, and contained a cluster of tetraspores. The tetraspores were supposed to have the nature of buds or gemmæ rather than of true spores, and gave origin to new plants. From the researches of Dr. Radlkofer, on fecundation in the algæ, it was highly probable that other organs of reproduction remained to be observed in the Corallines, similar to those which in other algæ gave rise to phenomena somewhat analogous to the alternation of generations, recognised in some portions of the animal kingdom. There were three British species of *Corallina*, and two of *Jania*, all of which were small. In *Corallina* the frond was mostly pinnate, in *Jania* it was dichotomously forked. The long and slender branches, coated with an inflexible crust of lime, would manifestly be destroyed by the smallest currents, but for the articulations, which gave the whole plant a kind of flexibility. In the family *Nulliporæ*, belonging to the same order, the fronds were sufficiently short and stout to resist the action of the waves, and the species were distinguished from those of the *Corallineæ* by the absence of articulations.

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DONATIONS

FROM JUNE 1858 TO MAY 1859.

October 18th, 1858. *From the Society* — Journal Statistical Society, Vol. xxi. Part 3.

From the Academy — Journal of Antiquities in the Museum of the Royal Irish Academy.

From the Society — Notices of the Royal Astronomical Society, Vol. xviii. Nos. 6, 7, 8, 9.

From the Author — Papers read to the Botanical Society of Edinburgh, by Dr. G. Lawson.

From the Society — Proceedings of the Linnæan Society, Vol. iii. No. 9.

From the Association — Proceedings of the Dublin University Zoological and Botanical Association, Vol. i. No. 1.

From the Author — On the Total Eclipse of the Sun, September 7th, 1858, by R. C. Carrington, Esq.

From the Society — Twenty-fifth Annual Report of the Royal Cornwall Polytechnic Society.

From the Author — Course of German Exercises, by Dr. Lebahn.

From the Society — Annual Report and List of Members of the Yorkshire Philosophical Society.

From the Author — Impressions of Western Africa, by Thomas J. Hutchinson, Esq.

From the Author — Will there be War with France? by Dr. Retslag.

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From the Author — Inaugural Address on Botanical Study, by Cuthbert Collingwood, M.B., &c.

From the Institution — Proceedings of the Royal Institution of Great Britain, No. 8.

From the Society — Transactions of the Tyneside Naturalists' Field Club, Vol. iii. No. 4.

From the Society — Journal of the Geological Society of Dublin, Vol. viii. No. 1.

From the Society — Proceedings of the Zoological Society, Nos. 349–361.

From Dr. Inman — Report of the British Association. Meeting at Dublin.

November 1st. *From the Society* — Journal of the Royal Dublin Society, Vol. i.

From the Society — Report of Council (19th) of the Royal Botanic Society of London; and Herbaceous Plants and Ferns grown in their garden.

November 15th. *From the Society* — Journal of Proceedings of Linnæan Society, Vol. iii. No. 10.

From Mr. Higginson — Health of Towns' Advocate, Parts 1 and 2.

From the Secretary — Dipterous Insects of District round Liverpool. By the Rev. H. H. Higgins, M.A.

December 13th. *From the Society* — Memoirs, N.S. Vol. xv. Part 1, and Proceedings, Nos. 1–14, of the Literary and Philosophical Society of Manchester.

January 10th, 1859. *From the Society* — Journal Statistical Society, Vol. xxi. Part 4.

From the Society — Proceedings of the Liverpool Philomathic Society, Vol. iii.

From the Committee — Tenth Annual Report of the Borough of Salford Museum and Library.

From the Society — Notices of the Royal Astronomical Society, Vol. xix. Nos. 1 and 2.

From the Society — Proceedings of the Zoological Society, Nos. 362–369.

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From the Society — Transactions of the Historic Society of Lancashire, Vol. x.

January 24th. *From the Society* — Journal of the Royal Dublin Society, Nos. 9–11.

February 7th. *From the Club* — Proceedings of the Berwickshire Naturalists' Club, Vol. iv. No. 2.

From the Society — Transactions of the Botanical Society of Edinburgh, Vol. vi. Part 1.

From the Society — Journal of Proceedings of the Linnæan Society, Vol. iii. Part 2.

From the Society — Proceedings of the Philosophical Society of Glasgow, Vol. iv. Part 1.

March 7th. *From the Society* — Journal of Proceedings of the Linnæan Society, No. 1, Sup. to Botany.

From the Society — Journal Statistics Society, Vol. xxii. Part 1.

March 21st. *From the Society* — Notices of the Royal Astronomical Society, Vol. xix. Nos. 4, 5.

From the Association — Transactions of the National Association for the Promotion of Social Science, 1858.

From Mr. MacFie — Letters on coating with manure the seed of wheat and other cereals before sowing it, by John Ronald.

April 18th. *From the Society* — Memoirs of the Literary and Philosophical Society of Manchester.

From the Institution — Report of the Royal Institution, Liverpool.

From the Society — Journal of Proceedings of the Linnæan Society, Vol. iii. No. 12.

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NOTE.

The paging of the Appendix is continued on from last volume.

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APPENDIX.

SYNOPSIS AND LIST

OF

BRITISH

GASTEROMYCETES.

BY THE

REV. HENRY H. HIGGINS, M.A. CANTAB., V.P.

READ BEFORE THE SOCIETY ON THE 24TH JANUARY, 1859.

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GASTEROMYCETES. Fries.

Mycelium gelatinous, floccose, or cellular, giving rise to a distinct often stipitate peridium, consisting of one or more coats, enclosing free or compacted threads or laminæ, from which the spores spring; and in the most highly organized genera, a distinct though convolute hymenium. Spores naked, or very rarely surrounded by a cyst, but then springing from the tip of the fertile thread.

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SYNOPSIS OF

GASTEROMYCETES.*

CONIOSPERMOUS.

PODAXINEI.

Stipitate, subclaviform; hymenium convolute, enclosed in a volvalike peridium, withering or entirely drying up so as to form a dusty mass.

HYPOGÆI.

Subterraneous; naked, or invested with a confluent or very rarely a distinct peridium.

PHALLOIDEI.

Hymenium passing into a diffluent mass.

NIDULARIACEI.

Peridium enclosing one or more distinct free or stipitate sporangia, which contain a mass of cells, of which the central ones produce spores or sporophores.

HYMENOMYCETOUS.

TRICHOGASTRES.

Plant at first cellular. Hymenium drying up and leaving a dusty mass of threads (capillitium) and spores.

MYXOGASTRES.

Whole plant at first gelatinous. Peridium containing at length a dusty mass of threads and spores.

* The above synopsis of *Gasteromycetes* is taken from the Rev. M. J. Berkeley's "Introduction to Crytogamic Botany."

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Section I. HYPOGÆI. Berkeley.

Genus HYMENOGASTER. Vittadini.

Peridium sub-globose, smooth, with a rhizoid base; substance homogeneous, distinctly cellulose; basidia simple, equal; spores smooth, bluntly fusiform, with a compound nucleus.

Genus HYSTERANGIUM. Vittadini.

Peridium smooth or fibrillose; substance veiny, sub-gelatinous, disposed concentrically; basidia much crowded, linear, six or eight spored; spores simple, oblong.

Genus HYDNANGIUM. Wallroth.

Peridium carnoso-coriaceous; substance fleshy, cellulose-venose; basidia generally two spored; spores globose, echinulate or verrucose

Genus MELANOGASTER. Corda.

Peridium fleshy; substance minutely cellulose, sooty; spores pyriform or sub-fusiform, very black.

Genus OCTAVIANA. Vittadini.

Peridium rotund, smooth, rooting; substance carnoso-cellulose; cells crowded, oblong; spores rough, with stellate granulations.

Section II. PHALLOIDEI. Fries.

Genus PHALLUS. Micheli.

Peridium sub-rotund, rooting, consisting of a double membrane distended by a gelatinous substance, at length ruptured by the stipitate, highly porous receptacle, the apex of which is furnished with a more or less campanulate reticulated appendage; border entire; hymenium sinuous, gelatinous; spores simple; basidia none.

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Genus CLATHRUS. Micheli.

Peridium volva-like, furnished with rootlets, coriaceous, globose, at length bursting irregularly; receptacle sessile, rotund, carnose, latticed, containing a gelatinous mass and a moist mealy fertile substance, both of which at length deliquesce, leaving the receptacle empty; columella none; spores simple.

Section III. NIDULARIACEI. Corda.

Genus CYATHUS. Haller.

Peridium crucible shaped, at first closed by a distinct veil as by an operculum, at length open, containing a pulp enclosing lentiform umbilicated sporangia, which are attached to the peridium by elastic umbilical threads; sporangia containing subramose flocci bearing simple spores.

Genus NIDULARIA. Bulliard.

Peridium at first sub-globose, at length crucible shaped, open; sporangia lentiform or globose, attached by their margin.

Genus SPHÆROBOLUS. Tode.

Peridium double, at first covered by a very fugacious floccose veil; outer peridium globose, carnose, cleft at the summit in a star-like figure, segments at length recurved; inner peridium cup shaped, elastic, tough, lubricated, attached by the margin to the base of the segments, in maturity it becomes suddenly everted, projecting the globose sporangium.

Section IV. TRICHOGASTRES. Fries.

Genus POLYSACCUM. Desportes.

Peridium carnoso-coriaceous, bursting irregularly at the apex, stipitate, distinctly cellular within; sporangia disposed singly in the cells, filled with flocci mingled with the simple spores.

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Genus SCLERODERMA. Persoon.

Peridium sub-rotund, coriaceous, bursting irregularly, within sub-cellular; spores simple clustered, not encysted.

Genus BATARREA. Persoon.

Peridium subterraneous, double, distended by a fertile pulp, at length bursting irregularly; receptacle stipitate, pileate, rising above the soil, covered everywhere by the simple spores; stem woody; pileus membranaceous, hooded by a portion of the inner peridium.

Genus GEASTER. Micheli.

Peridium double, outer distinct, carnoso-coriaceous, splitting into starlike expanding segments; inner membranaceous, at length perforated or with an ostiolum at the apex.

Genus PILACRE. Fries.

Peridium capitate, umbilicate beneath, membranaceous above, very delicate, splitting. (Fries regards the peridium as more properly a receptacle on which is a layer of spores, covered by a fugacious veil.)

Genus TULOSTOMA. Persoon.

Peridium double, outer volva-like and very fugacious; inner sub-globose, membranaceous, at length stipitate with a prominent ostiolum.

Genus LYCOPERDON. Tournefort.

Peridium of two or more coats, the innermost of which alone is persistent, outer often appearing in the form of deciduous morts or spines.

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Genus BOVISTA. Persoon.

Peridium double, outer subcarnose easily separable, at length deciduous, inner papyraceous persistent.

Section V. MYXOGASTRES. Fries.

A Spores not encysted.
B Peridium determinate subverrucose. LYCOGALA. Micheli.
B B Peridium indeterminate or membranaceous.
C Peridium indeterminate.
a Internal flocci none. SPUMARIA. Persoon.
a a Flocci branched reticulated forming a pellicle. RETICULARIA. Bul.
a a a Flocci forming cells but no pellicle. ÆTHALIUM. Link.
C C Peridium membranaceous.
b Peridium wholly fugacious.
c Peridium with a central collumella.
d Stem setaceous. STEMONITIS. Gleditsch.
d d Stem terete. DIACHEA. Fries.
c c Peridium with no columella.
e Flocci closely interwoven. ARCYRIA. Persoon.
e e Flocci forming irregular reticulations. CRIBRARIA. Schrad.
e e e Flocci radiating, with transverse fibres. DICTYDIUM. Schrad.
b b Peridium persistent beneath.
f Internal flocci none.
g Peridium opening by an horizontal section. PERICHÆNA. Fries.
g g Peridium opening irregularly. LICEA. Schrad.
f f Internal flocci mingled with the spores.
h Peridium with operculum. CRATERIUM. Trenth.
h h Peridium single, very delicate. PHYSARUM. Persoon.
h h h Peridium double, outer smoth. DIDERMA. Link.
h h h h Peridium double, outer mealy. DIDYMIUM. Link.
b b b Peridium wholly moderately persistent. TRICHIA. Hall.
A A Spores clustered encysted.
i Peridum delicate fugacious. ENERTHENEMA. Bowman.
i i Peridium at length ruptured at the apex. BADHAMIA. Berk.

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LIST OF

BRITISH GASTEROMYCETES.

Section I. *HYPOGÆI*. Berkeley.

Genus I. HYMENOGASTER. Vittadini.

1 H. citrinus. Vit. An. 293.
2 H. luteus. Vit. An. 294.
3 H. olivaceus. Vit. An. 295.
var. modestus. Berk & Broom. Hyp. Fungi.*
4 H. tener. Berk. An. 297. = H. argenteus. Tul.
5 H. muticus. Berk. An. 376.
6 H. vulgaris. Tul. Hyp. Fungi.
7 H. pallidus. Berk. & Broome. Hyp. Fungi.
8 H. decorus. Tul. Hyp. Fungi.
9 H. Thwaitesii. Berk & Broome. Hyp. Fungi.
10 H. pusillus. Berk & Broome. Hyp. Fungi.

Genus II. HYSTERANGIUM. Vittadini.

11 H. nephriticum. Berk. An. 298.
12 H. Thwaitesii. Berk. 377.

* Notices of British Hypogæous Fungi, by the Rev. M. J. Berkeley, M A., F.L.S., and C. E. Broome, Esq. Ann. & Mag. N. Hist. vol. xxviii.

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Genus III. HYDNANGIUM. Wallroth.

13 H. CAROTÆCOLOR. Berk. An. 299.
14 H. STEPHENSII. Berk. An. 300.

Genus IV. MELANOGASTER. Corda.

15 M. BROOMEIANUS. Berk. An. 301. Sow. t. 426.

Genus V. OCTAVIANA. Vittadini.

16 O. AMBIGUA. Vit. An. 302.
17 O. ASTEROSPERMA. Vit. Hyp. Fungi.

SECTION II. *PHALLOIDEI.* Fries.

Genus VI. PHALLUS. Micheli.

1 P. IMPUDICUS. L. E.F. p. 226.
2 P. IOSMOS. Berk. E.F. p. 227.
3 P. CANINUS. Huds. E.F. p. 227.

Genus VII. CLATHRUS. Micheli.

4 C. CANCELLATUS. L. An. 304.

SECTION III. *NIDULARIACEI.* Corda.

Genus VIII. CYATHUS. Haller.

1 C. CRUCIBULUM. Pers. E.F. p. 229.

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Genus IX. NIDULARIA. Bulliard.

2 N. STRIATA. Bull. E.F. p. 229.
3 N. CAMPANULATA. With. E.F. p. 229.

Genus X. SPHÆROBOLUS. Tode.

4 S. STELLATUS. Tode. E.F. p. 231.

SECTION IV. *TRICHOGASTRES.* Fries.

Genus XI. POLYSACCUM. Desportes.

1 P. OLIVACEUM, Fries. E.F. p. 306.

Genus XII. SCLERODERMA. Persoon.

2 S. VULGARE. Fr. E.F. p. 305.
3 S. BOVISTA. Fr. E.F. p. 306.
4 S. VERRUCOSUM. Bull. E.F. p. 306.

Genus XIII. BATARREA. Persoon.

5 B. PHALLOIDES. Woodw. E.F. p. 298. An. 303.

Genus XIV. GEASTER. Michcli.

6 G. COLIFORMIS. Dicks. E.F. p. 299.
7 G. FORNICATUS. Huds. E.F. p. 300.
8 G. STRIATUS. Dec. E.F. p. 300.
9 G. BRYANTII. Berk. E.F. p. 300.
10 G. LIMBATUS. Fri. E.F. p. 301.
11 G. MAMMOSUS. Chev. E.F. p. 301. An. 379. Sow. t. 401.
12 G. RUFESCENS. Fries. An. 378.

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13 G. HYGROMETRICUS. Pers. E.F. p. 302.
14 G. FIMBRIATUS. Fr. An. 209 & 378. = G. RUFESCENS. Pers. E.F. p. 301.

Genus XV. PILACRE. Fries.

15 P. FAGINEA. Berk. & Broome. An. 380.

Genus XVI. TULOSTOMA. Pers.

16 T. MAMMOSUM. Fr. E.F. p. 305.

Genus XVII. LYCOPERDON. Tournefort.

17 L. GIGANTEUM. Batsch. E.F. p. 303.
18 L. CŒLATUM. Bull. E.F. p. 303.
19 L. PUSILLUM. Bat. E.F. p. 304.
20 L. GEMMATUM. Bat. E.F. p. 304.
21 L. PYRIFORME. Schæff. E.F. p. 304.
22 L. SACCATUM. Schum. An. 210.
23 L. ATROPURPUREUM. Vit. An. 730.

Genus XVIII. BOVISTA. Persoon.

24 B. NIGRESCENS. Pers. E.F. p. 302.
25 B. PLUMBEA. Pers. E.F. p. 302.

SECTION V. *MYXOGASTRES.* Fries.

Genus XIX. LYCOGALA. Micheli.

1 L. EPIDENDRUM. L. E.F. p. 307.
2 L. PARIETINUM. Fr. An. 381.

Genus XX. SPUMARIA. Persoon.

3. S. ALBA. Bull. E.F. p. 309.

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Genus XXI. RETICULARIA. Bulliard.

4. R. MAXIMA. Fr. E.F. p. 308.
5. R. ATRA. Alb. & Sw. E.F. p. 308.
6. R. UMBRINA. Fr. E.F. p. 308.
7. R. OLIVACEA. Fr. E.F. p. 309.

Genus XXII. ÆTHALIUM. Link.

8 Æ. SEPTICUM. L. E.F. p. 309.

Genus XXIII. STEMONITIS. Gleditsch.

9 S. FUSCA. Roth. E.F. p. 317.
10 S. OVATA. Pers. E.F. p. 317.
11 S. OBTUSATA. Fr. E.F. p. 317.
12 S. PAPILLATA. Pers. E.F. p. 317.
13 S. TYPHOIDES. Dec. An. 118.
14 S. ARCYROIDES. Som. An. 114.
15 S. PULCHELLA. Bab. An. 217.
16 S. PHYSAROIDES. Alb. & Sw. An. 386.
17 S. VIOLACEA. Fr. An. 387.

Genus XXIV. DIACHEA. Fries.

18 D. ELEGANS. Fr. An 112.

Genus XXV. ARCYRIA. Persoon.

19 A. PUNICEA. Pers. E.F. p. 318.
20 A. INCARNATA. Pers. E.F. p. 318.
21 A. CINEREA. Bull. E.F. p. 318.
22 A. NUTANS. Bull. E.F. p. 319.
23 A. OCHROLEUCA. Fr. An. 115.
24 A. UMBRINA. Schum. An. 389.

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Genus XXVI. CRIBRARIA. Schrad.

25 C. INTERMEDIA. Berk. E.F. p. 318.

Genus XXVII. DICTYDIUM. Schrad.

26 D. UMBILICATUM. Schrad. E.F. p. 318.

Genus XXVIII. PERICHÆNA. Fries.

27 P. ABIETINA. Fr. E.F. p. 321.
28 P. POPULINA. Fr. E.F. p. 321.
29 P. STROBILINA. Fr. E.F. p. 321.

Genus XXIX. LICEA. Schrad.

30 L. FRAGIFORMIS. Nees. E.F. p. 321.
31 L. CYLINDRICA. Fr. E.F. p. 321.
32 L. PERREPTANS. Berk. An. 392.
33 L. APPLANATA. Berk. An. 393.

Genus XXX. CRATERIUM. Trenth.

34 C. LEUCOCEPHALUM. Hoffm. E.F. p. 316.
35 C. MINUTUM. Leers. E.F. p. 316.
36 C. MUTABILE. Fr. E.F. p. 316.
37 C. PEDUNCULATUM. Trent. E.F. p. 316.
38 C. PYRIFORME. Ditm. E.F. p. 316.
39 C. VULGARE. Ditm. E.F. p. 316.

Genus XXXI. PHYSARUM. Persoon.

40 P. NUTANS. Pers. E.F. p. 314.
41 P. BULBIFORME. Schum. E.F. p. 315.
42 P. RUBIGINOSUM. Chev. E.F. p. 315.
43 P. SINUOSUM. Bull. E.F. p. 315.
44 P. ALBUM. Nees. E.F. p. 315.

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45 P. LILACINUM. Fr. An. 215.
46 P. ATRUM. Fr. An. 216.

Genus XXXII. DIDERMA. Link.

47 D. FLORIFORME. Bull. E.F. p. 310.
48 D. UMBILICATUM. Pers. E.F. p. 310.
49 D. CITRINUM. Schum. E.F. p. 310.
50 D. VERNICOSUM. Pers. E.F. p. 310.
51 D. SPUMARIOIDES. Fr. E.F. p. 311.
52 D. TREVELYANI. Fr. E.F. p. 311.
53 D. CARMICHAELIANUM. Berk. E.F. p. 311.
54 D. NITENS. Kl. E.F. p. 311.
55 D. GLOBOSUM. Pers. E.F. p. 312.
56 D. CYANESCENS. Fr. E.F. p. 312.
57 D. DEPLANATUM. Fr. E.F. p. 312.
58 D. CONTEXTUM. Pers. An. 109.

Genus XXXIII. DIDYMIUM. Link.

59 D. HEMISPHÆRICUM. Bull. E.F. p. 312.
60 D. SQUAMULOSUM. Alb. & Sw. E.F. p. 312.
61 D. FARINACEUM. Schrad. E.F. p. 313.
62 D. NIGRIPES. Lk. E.F. p. 313.
63 D. PERTUSUM. Berk. E.F. p. 313.
64 D. LEUCOPUS. Lk. E.F. p. 313.
65 D. SOWERBEI. Berk. E.F. p. 313.
66 D. LOBATUM. Nees. E.F. p. 314.
67 D. PHYSARIOIDES. Pers. E.F. p. 314.
68 D. CINEREUM. Batsch E.F. p. 314.
69 D. SERPULA. Fr. E.F. p. 314.
70 D. MELANOPUS. Fr. An. 110, 382.
71 D. XANTHOPUS. Fr. An. 111.
72 D. TIGRINUM. Schrad. An. 383.
73 D. CONGESTUM. Berk. & Broome. An. 384.

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74 D. DÆDALEUM. Berk. & Broome. An. 385.
75 D. FURFURACEUM. Schum. An. 734.

Genus XXXIV. TRICHIA. Hall.

76 T. PYRIFORMIS. Hoffm. E.F. p. 319.
77 T. SEROTINA. Schrad. E.F. p. 319.
78 T. FALLAX Pers. E.F. p. 319.
79 T. CLAVATA. Pers. E.F. p. 320.
80 T. TURBINATA. With. E.F. p. 320.
81 T. CHRYSOSPERMA. Dec. E.F. p. 320.
82 T. VARIA. Pers. E.F. p. 320.
83 T. SERPULA. Pers. E.F. p. 320.
84 T. NEESIANA. Cord. An. 218.
85 T. AYRESII. Berk. & Broome. An. 390.

Genus XXXV. ENERTHENEMA. Bowm.

86 E. ELEGANS. Bowm. An. 388. Lin. Tr. vol. xxi. p. 151.

Genus XXXVI. BADHAMIA. Berk.

87 B. NITENS. Berk. An. 731. Lin. Tr. vol. xxi. p. 153.
88 B. PALLIDA. Berk. An. 732. Lin. Tr. vol. xxi.
89 B. FULVELLA. Berk. An. 733. Lin. Tr. vol. xxi.
90 B. HYALINA. Berk. & Broome=PHYSARUM HYALINUM. Pers.
91 B. UTRICULARIS. Berk. & Broome=PHYSARUM UTRICULARE. Chev.
92 B. CAPSULIFER. Berk. & Broome
=SPHÆROCARPUS CAPSULIFER.

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THE FUNGI OF LIVERPOOL

AND ITS VICINITY.

PART II.

GASTEROMYCETES:

BY THE

REV. HENRY H. HIGGINS, M.A. CANTAB., V.P.

READ BEFORE THE SOCIETY ON THE 24TH JANUARY, 1859.

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PREFACE.

The Gasteromycetes or pouched Fungi, though on the whole much inferior to the Hymenomycetes, include certain species yielding to none of their class in interest and beauty.

The first section, Hypogæi, has been formed by Rev. M. J. Berkeley in order to preserve the primary division of the Fungi into Sporiferi with naked spores, and Sporidiiferi with sporidia enclosed in sacs; it excludes therefore the genuine Truffles, all of which have sporidia enclosed in asci, whilst it includes several genera otherwise closely allied to them.

Few of the species are of much interest, and owing to their underground habits they are found with difficulty. In Britain they appear to be far more common in the south than in the north. I have sought for them repeatedly in the neighbourhood of Liverpool, but without success.

In the next section, Phalloidei, we meet with forms as extraordinary as any that are to be found in the vegetable kingdom. Some of our native species are well known and have obtained notoriety chiefly on account of their disgusting odour. Impressions made upon the sense of smell have hitherto been associated with too much of the ludicrous to admit of their having been examined with the care which has been bestowed upon the impressions received by the organs of sight and hearing. Should it ever be otherwise, it may probably be considered a fact of some importance, that the odour of the *Phallus impudicus* seems to diminish in intensity on a closer approach to the plant, which may even be held to the nostrils without producing nausea, at the very

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time when it is rendering a whole house uninhabitable, or powerfully repelling an observer at the distance of eight or ten yards. Whatever then may be the emanations from the fungus which act so disagreeably upon the sense of smell, it is plain they do not follow the law of the intensity being inversly as the square of the distance, unless indeed the result be deemed a parallel to the darkness said to be produced by excess of light.

We must however visit warmer climates to see in perfection the perishable beauties of many of the species in this section, especially those belonging to the genera *Clathrus*, *Latternea*, *Calathiscus*, and *Lysurus*. A single species of *Clathrus* has been found in the extreme South of Britain: the rest belong entirely to tropical or sub-tropical regions.

In *Clathrus crispus* the globose receptacle is pierced with oval apertures adorned with sculpture, reminding us of the ivory balls so curiously fashioned by the Chinese. In *Laternea triscapa* three spirally fluted columns rise from the base of the peridium, meeting in a graceful curve at the apex. In *Calathiscus sepia*, a multitude of appendages like tentacles surround the mouth of the receptacle. In *Aserös pentactina* five bifid arms, like the rays of a star-fish, occupy the same position. In *Lysurus mokusin* the summit resembles the head of an encrinite. In all these it is not difficult to trace modifications of the reticulated structure of the receptacle, observable in our native *Phallus impudicus*, and which in *Hymenophallus indusiatus* assumes the form of a spreading skirt, composed of network surpassing the richest and finest lace. The beauty of these elaborate structures is often enhanced by the most vivid colouring; the disagreeable quality of the British Phalloidæ is however shared by most of the foreign species.

The Nidulariacei are much more adequately represented by our native species, and the four kinds recorded as British have all been found within the Liverpool district. *Sphærobolus stellatus* was the subject of a short paper communicated by myself to this Society in 1856. *Nidularia striata* is one of the most interesting of all the fungi. It may be sought for with success amongst fallen leaves and branches in any of our neighbouring woods, late in Autumn. Sombre in its colour and retiring in its habits, it is

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betrayed by the beauty and regularity of its form. In the debris of decaying twigs and stems of leaves and rotting fragments of bark and wood, the eye is at once caught by a congeries of little cups, exquisitely fringed and containing five or six sporangia, shaped like lentil seeds; the outside of the cup is shaggy with moss-like fibres. The modesty and symmetry of this little plant, together with its striking resemblance to a bird's nest containing eggs, render it indeed to the finder a welcome prize.

The fourth section, Trichogastres, is much more extensive than the last, and includes the fungi, commonly known as puff-balls. *Lycoperdon giganteus*, the largest of the tribe, occurs every year in the grounds of W. Bell, Esq., at Pexhill; a specimen found there in the present year exceeded four feet in circumference. The Rev. M. J. Berkeley states, that this species when young is considered excellent for food by all who have partaken of it. Batarrea is remarkable for its woody substance, exhibiting "as true vascular tissue as in any exogen or endogen."* *Batarrea phalloides* is one of the most rare of the British fungi; before it was found by myself at Wallasey its northern limit was considered to be the county of Norfolk. In Geaster, the forms are exceedingly striking and varied, exhibiting in a high degree the inexhaustible diversity of means employed by the Great Creator, for securing the health and perpetuity of the species he has thought fit to call into existence.

In the fifth and last section, Myxogastres, the species are very numerous and are for the most part small in size, seldom exceeding a line or two in height. Many of them are very pretty; nothing can surpass the elegance of the golden drooping plumes of *Arcyria nutans*, or the exquisite delicacy of the texture in *Dictydium umbilicatum*; its balloon-like head nodding on its stem as though its task accomplished, it had just descended and consigned to earth some fairy being alighted from an aërial trip.

In proposing again to occupy with this subject so large a space in your annual volume of Proceedings, it may be proper for me to state my reasons for regarding a Synopsis and List of British Gasteromycetes a desideratum. Since the publication by the

* "Introduction to Cryptogamic Botany," by the Rev. J. M. Berkeley, p. 7.

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Rev. M. J. Berkeley, of the fifth volume of the English Flora, in 1836, ten genera and forty-eight species of Gasteromycetes have been added to the British Flora, notices of which are only to be found scattered through many volumes of the Annals and Magazine of Natural History. But that which is of more importance is the total revision which the subject has undergone, principally in the hands of the Rev. M. J. Berkeley, by whom the true character of the fructification in some of the noblest species of the order was first investigated and unfolded.

In justice to our local Flora it is right to state, that the same amount of care has not been bestowed upon the local species of Myxogastres as upon the Hymenomycetes and the former sections of the Gasteromycetes. In Phalloidei, Nidulareacei, and Trichogastres, out of thirty-three species recorded as British, twenty have been found in the neighbourhood of Liverpool; and one occurred which is probably new to British botany. In Myxogastres many additional species might no doubt readily be discovered, and together with several very interesting additions to our list of local Hymenomycetes collected during the present season, might properly form a supplement to the series described in the Appendices to the Proceedings of our Society.

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GASTEROMYCETES.

Section I. *PHALLOIDEI.* Fries.

Genus I. PHALLUS. Micheli.

1 P. IMPUDICUS. L.

Peridium white, flexible, the size of a hen's egg, rooting, stuffed with an olivaceous jelly enclosing the receptacle which soon ruptures the peridium and attains a height of from six inches to a foot; stem very porous, surmounted by a partly free campanulate appendage with wide reticulations and a truncated apex. This, under the common name of Stinkhorn, is a well known species and is found in woods and on banks in many places near Liverpool; it is common in the Wirral and at Knowsley, Crosby, &c.

2 P. CANINUS. Huds.

Smaller and more slender than the last species; apex of the receptacle sub-fusiform, orange-red, at first covered with dark olive, green slime. Knowsley. Hundreds occurred in Croxteth Wood, October 1857. Warren, New Brighton, Nov., 1858.

Section II. *NIDULARIACEI.* Corda.

Genus II. CYATHUS. Haller.

1 C. CRUCIBULUM. Pers.

Cups crowded, shallow, at first closed by an operculum. On chips, Two-butt Lane, Rainhill, 1856, 1857.

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Genus III. NIDULARIA. Bulliard.

2 N. STRIATA. Bull.

Cups crowded, deep, clothed on the outside with dark-brown tufted hirsuteness. Eastham and Bromborough Woods; Warren, New Brighton.

3 N. CAMPANULATA. With.

Cups gregarious or solitary, lead coloured within, elegantly shaped, widening upwards. Under beech trees, Rainhill; Botanic Garden, Liverpool.

Genus IV. SPHÆROBOLUS. Tode.

4 S. STELLATUS. Tode.

The description of this species is already published in the Proceedings of this Society. Plantation, Huyton Quarry; Hangsdales Wood, Rainhill.

SECTION III. *TRICHOGASTRES.* Fries.

Genus V. SCLERODERMA. Persoon.

1 S. VULGARE. Fr.

Peridium sub-globose or depressed, warty or scaly, sometimes exceeding four inches in diameter, yellowish, bursting irregularly, filled with greyish flocci which in age become darker. Not very common; in woods, Knowsley, Croxteth, &c.
Var. b. Smaller hard minutely warty generally of a light-brown colour. Very common; woods, plantations, and banks.

2 S. VERRUCOSUM. Bull.

Peridium more fragile than in the preceding species, stipitate; stem deeply lacunose. Bromborough Wood, Nov., 1856.

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Genus VI. BATARREA. Persoon.

3 B. PHALLOIDES. Woodw.

Stem woody with shaggy fibres, six inches in height, half an inch in thickness; pileus delicate, semi-oval, diameter at the margin 1½ inches. In bare sand on the broken bank of a hedge, near the top of the hill, Claremont, New Brighton, Nov. 12, 1857.

Genus VII. GEASTER. Micheli.

1 G. STRIATUS. Dec.

Outer peridium expanding in from four to six star-like rays, inner globose shortly pedicellate, of a pale woody colour; ostiolum conical distinctly striate. On a sandy bank at Little Brighton near Crosby, Oct., 1856.

2 G. BRYANTII. Berk.

Differs from the preceding species in the base of the inner peridium, which is constricted so as to form a groove just above the insertion of the somewhat longer stem. Cheshire; Mr. Nisbett, Nov. 26, 1855. Not uncommon on sandy banks near Wallasey; Warren, New Brighton, &c.

3 G. MAMMOSUS. Chev.

Height two inches, diameter two inches, diameter of the inner peridium one inch; outer peridium consisting of two layers, each nearly one line in thickness, adnate for the upper half; the outer layer splits into five equal segments, curling back till their points meet beneath; the under or free half of the inner layer is not carried back with the revolute segments but stands with a broken uneven edge, cup-shaped, twice the diameter of and surrounding the papyraceous inner peridium, which is quite sessile, somewhat oblate; mouth conical, not striate; spores round, echinulate ·0002 inch in diameter; colour when gathered bright nankin, soon becoming dingy. Warren, New Brighton, Nov. 14, 1857.

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Genus VIII. TULOSTOMA. Persoon.

4 T. MAMMOSUM. Fr.

Inner peridium globose, three or four lines in diameter, with a prominent ostiolum; stem an inch or more in height, hard; the remains of the fugacious outer peridium form a globose bulb at the base. Warren, New Brighton; Southport, F. P. Marrat.

Genus IX. LYCOPERDON. Tournefort.

5 L. GIGANTEUM. Batsch.

Peridium bursting in irregular cracks, sub-globose, from six to eighteen inches in diameter; capillitium olivaceous yellowish or dingy, filling nearly the whole of the peridium. If gathered when the plant has attained its full size, and kept in a dry atmosphere, the whole mass becomes extremely wet, and the peridium flaccid and tender: at this period of its growth in the open air it is usually broken up and scattered, leaving scarcely any traces; but under shelter the peridium though much cracked dries and is moderately persistent. The figures of Batsch, Schaffer, and Greville, are all excellent, and the globose figure in Sow., t. 332, seems equally accurate. The obconic form which Fries regards as agreeing well with *L. bovista* of Persoon, seems rightly in the English Flora, referred to the next species. Grounds of W. Bell, Esq., Pexhill; annually, in October.

6 L. CŒLATUM. Bull.

Peridium stoutly obconic, with a broad base, upper portion four or five inches in diameter. At the period of semi-deliquescence referred to in the description of *L. giganteum*, the peridium does not crack on all sides, but the upper portion sloughs away, and the capillitium escapes, leaving a cup with a ragged edge, a spongy barren stratum filling the bottom of the cup and the stem, which often remain almost unchanged for many months. There seems little doubt that this is the plant represented by the uppermost figure in Sow. p. 332. Bulliard's figure agrees well with a warty variety; but another, with precisely the same habit, is equally frequent, and is nearly smooth. Both seem abundantly distinct from *L. giganteum*. Batsch. Not very common. Warren, New Brighton, Ince Blundell, Croxteth.—BOVISTA FAVOSA. Rostk. Sturm's Deutschlands Flora, occurs at New Brighton.

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7 L. GEMMATUM. Batsch (Micheli).

None of the authorities quoted by Fries appear to give at all distinctly the typical form of this most variable species. Batsch has no plate of it, and refers to Micheli as his authority; Bolton's plate, exclusive of *figs. a* and *c*, represents forms totally unlike each other. "Bulliard champ. p. 143, melior pars," is a reference of no practical use. Happily, some of the varieties are better defined.

Var. α. L. EXCIPULIFORME. Fries.

Peridium sub-rotund, beset with scattered sub-spinulose warts; stem elongated, sub-plicate at the base. Not very common. In plantations, borders of fields, &c. Knowsley, Bromborough.

Var. β. L. PERLATUM. Persoon.

Peridium rounded, somewhat depressed, warts strongly prominent, pointed, at length deciduous; stem round, subscabrous. Very common, sometimes crowded and gregarious in prodigious numbers. Under or near trees.

Var. γ. L. ECHINATUM. Persoon.

Peridium top-shaped, sub-stipitate, rough, with firm, spurious, sub-distant warts.

Var. δ. L. HIRTUM. Micheli.

Peridium turbinate, hairy, with thin, soft, at length generally blackish warts.

The preceding varieties, with many intermediate forms, are common in grassy places on the coast. Colour generally yellowish or deep umber.

Var. ε. L. PAPILLATUM. Schæff.

Sub-rotund, sessile, papillary, furfuraceo-pulverulent. A form well agreeing with this description, and which is certainly not *L. pusillus* (Batsch.), occurs frequently in old pastures, and is nearly always solitary.

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8 L. PYRIFORME. Schæff.

Peridium sub-pyriform, opening by the somewhat prominent apex; collumella conic. Varying in colour from light to deep rich brown; the slender warts also vary, and are sometimes nearly obsolete. Not uncommon on stumps: generally in crowded tufts.

9 L. SACCATUM. Schum.

Peridium somewhat depressed above, sub-concave or vaulted beneath, in substance like tissue paper, wrinkled, rather shining, greyish; epidermis almost altogether fugacious, but leaving a roughness on the peridium. The above is a description of a single tufted specimen, five inches in height, found in Knowsley Park in 1856.

Genus X. BOVISTA. Persoon.

10 B. NIGRESCENS. Persoon.

Peridium sub-rotund, 1–2 inches or more in diameter, oblong, often irregularly indented, in age stiff and persistent, variously shaded with brown and blackish tints. Spores globose, pedicellate from the sporophores which remain attached to them. Warren, New Brighton.

11 B. PLUMBEA. Persoon.

Less than an inch in diameter, rotund, in age less hard than the preceding, lead or slate coloured. Hoylake, Southport.

12 B.

Peridium perfectly flexible, rotund or oblong, one inch in diameter, white, at length pale brown: epidermis thin and very fugacious, but remaining on portions of the peridium in simple or ramose stars: spores pedicellate. *B. tunicata.* Fries? A few specimens occurred in pasture, Knowsley Park.

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Section IV. *MYXOGASTRES.* Fries.

Genus XI. LYCOGALA. Micheli.

1 L. EPIDENDRUM. L.

Peridium sub-globose, from the size of a pea to that of a hazel nut, often crowded and confluent, variously coloured, sometimes bright scarlet, and very beautiful, in age pale or dull-brown. Not uncommon. On palings, Childwall; on stumps and timber in many places.

Genus XII. SPUMARIA. Persoon.

2 S. ALBA. Bull,

Generally somewhat less than a walnut, frothy white; in maturity forming tube-like cells or folds.

Var. *α.* LAMINOSA.

Folds simple Not very common. On grass, Rainhill, Cheshire.

Var. *β.* CORNUTA.

Folds compound branched. In great abundance on the twigs of Salices, sand hills, Crosby.

Genus XIII. RETICULARIA. Bull.

3 R. MAXIMA. Fr.

Forming effused masses thick and broad as the palm of the hand, or even larger, at first mucilaginous, white, opaque, surface variously tuberculate, in age almost wholly transformed into a mass of purple brown spores. Cheshire, I. Byerley, Esq. Almost filling up a rat's hole at the root of a tree in my garden, Rainhill.

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4 R. UMBRINA. Fr.

Peridium very thin, shining with a silvery lustre; flocci branched, mass of spores dark umber. On stumps and timber, an inch or more in breadth, not uncommon. At the base of a dying oak tree, Knowsley; a foot in height, and spreading irregularly for many inches in breadth.

Genus XIV. ÆTHALIUM. Link.

5 Æ. SEPTICUM. L.

Peridium intermediate, irregular in size and shape; substance very porous, bright yellow. On decaying stems of grass. Carr Mill Dam.

Genus XV. STEMONITIS. Gleditsch.

6 S. OVATA. Pers.

Peridium oval, fugacious, bluish, stem a line or more in height Resembling a Physarum, but the columella is distinct. Fallen branches. Knowsley.

Genus XVI. ARCYRIA. Persoon.

7 A. PUNICEA. Pers.

Crowded, a line or more in height, peridium sub-cylindrical, very fugacious; the capillitum beset with spores; colour a very peculiar red, approaching vermilion. A lovely little plant. On decayed wood. Rainhill, Croxteth, Eastham.

8 A. INCARNATA. Persoon.

Capillitium flesh coloured, almost stemless. I have not seen the peridium. Bromborough Wood.

Genus XVII. PHYSARUM. Pers.

9 P. NUTANS. Pers.

Var. γ. P. AUREUM. Grev.

Peridium umbilicate, cernuous, golden yellow. On decayed wood, Knowsley.

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Genus XVIII. DIDERMA. Link.

10 D. VERNICOSUM. Pers.

Crowded, sub-pyriform, shining bay, inner peridium paler; spores dark. About a line in height. On fallen twigs. Halsnead.

Genus XIX. DIDYMIUM. Link.

11 D. SQUAMULOSUM. A. & S.

Pileiform, shortly stipitate, covered with the whitish grey, farinaceous remains of the outer peridium. On decaying leaves and twigs of Ulex. Warren, New Brighton.

12 D. FARINACEUM. Schrad.

Peridium sub-globose, mealy. On fallen branches, Knowsley.

13 D. NIGRIPES. Link.

Stem setaceous; much larger than in the preceding species. On fallen branches. Pexhill.

Genus XX. TRICHIA. Hall.

14 T. PYRYFORMIS. Hoffm.

Peridia pyriform, dark testaceous, growing in scattered groups on rotting wood. Croxteth, Rainhill.

15. T. CLAVATA. Pers.

Peridia club-shaped, yellowish; stem, and sometimes the base of the peridium rough. On stumps, Woolton Wood, and rather common in woods in Cheshire.

16 T. TURBINATA. With.

Resembling the preceding species, but sessile. Croxteth, on a fallen branch.

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17 T. CHRYSOSPERMA. Dec.

Nearly globose; peridium somewhat fugacious, scattering the capillitum and spores, which are of a bright golden yellow. Not uncommon on decayed wood in damp places.

18 T. SERPULA. Pers.

Confluent in wavy or annular streaks, one or even two lines in breadth, testaceous; spores golden-yellow. On a fallen and decayed tree, Woolton Wood.

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